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UNITED STATES DEPARTMENT OF AGRICULTURE

AGRICULTURAL MARKETING SERVICE

AGRICULTURAL ESTIMATES DIVISION

Report on

1957 RESEARCH SURVEYS

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BY

THE RESEARCH AND DEVELOPMENT STAFF

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May 1960

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1. Introduction

This report covers activities under the Division research program in 1957. As in previous reports of this kind, all material relates to studies conducted during that year. Several years have elapsed since the 1957 surveys were conducted so that additional data are now available and some conclusions could now be elaborated in the light of more recent work. However, the main purpose of these reports is to provide a record of activities during a specified year and everything covered in the present report relates to the 1957 studies only.

As usual, these surveys represent the joint efforts of the Research and Development Staff, the various Branches of the Division, and State Statisticians in the States concerned. The technical parts of this report were prepared by members of the Research and Development Staff. The portions dealing with field operations and costs were prepared by members of the Special Statistics Branch which has the responsibility for organizing and administering operational phases of the various surveys.

The pattern of surveys conducted during the year conforms to that established originally in 1954. The principal changes over 1956 were an enlargement of the sample used in the interview surveys, an extension of that work to additional States, and a new study on the objective measurement of Burley tobacco yield in Kentucky.

The sample used for the June interview surveys in the South was enlarged to about 2.5 times the size used in 1956. There was also a basic change in the sample design. The sample was allocated to individual States with regard to the importance of agricultural production. Within States the sample was allocated to crop reporting districts in proportion to value of sales of agriculture commodities as reported in the 1954 Census. In Mississippi the sample was enlarged to 300 segments to bring at least one State up to the level contemplated in the Division's proposed minimum operating program.

When steps were taken to enlarge the sample in the South it became evident that so many counties would be covered by sample segments that the momentary advantage of using a two-stage sample design, with counties serving as primary units, diminished rapidly. For that reason the two-stage design was abandoned in the South and sample segments were permitted to fall in all counties. The sample in the North Central region was unchanged from the previous year. The new States brought into the survey program were North Dakota, Montana, Wyoming, Colorado and New Mexico. Although only 40 sample segments were allocated to each of these States, the allocation within States was made on the same basis as in the South, so that it will not be necessary to change the basic design as the program grows over the years.

In addition to the new study on Burley tobacco yields in Kentucky, the objective yield program on cotton was extended to New Mexico, California and Arizona. The enumerative survey program was not extended to California and Arizona but sample segments were selected in the cotton-growing areas of those two States to provide a basis for the selection of sample cotton fields. The main feature of the work in these additional States involved a study of the fruiting behavior of cotton grown under irrigated conditions. That information was used to begin developing yield forecasting models for irrigated cotton comparable to the models developed previously for dryland areas of the South.

2. June Enumerative Survey

2.1 Sample Design

In 1957 this survey covered 2,417 area segments allocated to 12 Southern States: Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas and Virginia; 12 North Central States: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin; and 4 Western States: Colorado, Montana, New Mexico, and Wyoming.

The principal change in the sample design for 1957 occurred in the South and in the 4 Western States which, with North Dakota, were brought into the program for the first time. The change was primarily an enlargement of the sample in the South and the addition of new States to the program in the West. The work in the South was designed to bridge transition from research to an experimental operating level with additional funds made available specifically for that purpose. In addition, the collection of more detailed data on farm employment to be used in Farm Employment studies was integrated with these surveys in all regions covered. The role of the June 1957 survey was limited to the collection of the data for those Farm Employment studies. Even though that research itself was outside the scope of the projects covered by this report, this phase of the work serves as an example of how an interview survey program can serve a variety of special needs. Incorporating these studies with the June Survey also made it possible to enlarge the sample in Mississippi, which was selected as a pilot State, to 300 sample segments. This was done to test the practicability of proposed procedures for deriving State estimates and to study operational problems associated with the enlargement of the sample by States.

A change in sample design in the South involved allocating segments to States and to crop reporting districts within States on the basis of value of sales reported in the 1954 Census. Between States the allocation of sample segments was proportional to the square root of value of sales. Between crop reporting districts within States the allocation was proportional to value of sales. In the North Central States the sample design remained practically unchanged from the previous year. The sample in the Southern States was increased to about two and one-half times the size used in 1956. In North Dakota and the 4 Western States 40 segments were allocated to each State; these were allocated to crop reporting districts in proportion to the value of sales of agricultural products. Some minor changes were made in the samples for Nebraska, Kansas, and South Dakota where additional segments were added to the 1956 samples. Here new segments were added to those already in the crop reporting districts in such proportions as to make the combined sample equivalent to one that would result from an allocation proportional to the value of sales of agricultural products.

The enumeration was conducted by the closed-segment approach for crop acreages, other land uses, and livestock numbers which were recorded for individual fields that could be identified and delineated on large-scale area photographs. A detailed accounting was made of all land-use items and livestock numbers found within the boundaries of the selected sample segments. All land

within the boundaries of these selected segments under the control of a single operator was first delineated on the photo and recorded on the questionnaire as an operator tract. After this was done for each such tract, a detailed breakdown was made by individual fields within the tract. All crops and other land items were recorded and all livestock present within the boundaries of the tract were listed. In addition an "open-segment" or farm-headquarters approach was used for data on livestock, numbers of farm operators, and farm employment. All households within the boundaries of each sample segment were contacted for information on total land operated, acreages of principal crops on the entire place, and livestock numbers. This information was used to classify places as farms, or non-farms, when data were tabulated. Livestock data were recorded in detail for all places having resident operators within the sample segments so that comparisons could be made between livestock estimates computed from the closed-segment data and estimates computed from data covering entire farms. The dual approach was used principally to get estimates of numbers of farms and farm employment.

Another feature of the June 1957 Survey was the use of mark-sense cards designed for IBM equipment in connection with the farm labor questions in Georgia and North Carolina. In Georgia the mark-sense cards were used by all enumerators while in North Carolina they were used by half the enumerators. The enumerators marked the cards with special lithographic pencils; those marks were later to be translated into punched holes by IBM machines. If successful, this technique was to be employed more extensively in future surveys.

2.2 Appraisal of the Survey

The results from the June Interview Surveys for 1956 and 1957 show that the closed-segment approach was satisfactory for estimating both crop acreages and livestock numbers. In the Western States some difficulties were encountered in identifying boundaries of selected sample area segments, and in obtaining data on livestock numbers within those boundaries. However, such difficulties were no more serious than those encountered in enumerating livestock by any other method. An appraisal of the results indicates that closed-segment data are subject to fewer errors than data recorded for entire farms. This is believed to be the result of the simplicity of the operation since the enumerator must merely account for what he can in effect see within the segment boundaries. The sizes of the computed sampling errors agree rather well with those expected for the sample sizes employed. In the States covered by this survey, the closed-segment approach is effective in controlling non-sampling errors. By having to account only for tracts of land for which boundaries are shown on the photos with a known scale, gross errors can be detected immediately and are also less likely to arise.

Most of the difficulties in applying the closed-segment approach occurred with Western livestock. In cases where a sample segment included only a part of the range, and it was impracticable to determine the number actually present within the segment boundaries, a pro-rating procedure had to be used. In such cases, interviewers estimated the fraction of the total range included in the segment and pro-rated the total number of animals on the entire range to the segment on a percentage basis. In some cases large numbers of permittees had to be contacted to enumerate segments in public-land areas.

In general, the operation of the survey proceeded rather smoothly despite some delays in getting maps and aerial photographs into the field. Deficiencies found in reported data were largely of the kind that are due to inexperienced enumerators. With experience a competent enumerator makes fewer errors himself and also becomes adapt at spotting inconsistencies in farmers' replies and in judging whether reported data are in general agreement with what he sees on the ground and on the aerial photos.

2.3 Estimates of Crop Acreages and Numbers of Farms

These estimates are given in Table 2.1 for the 12 Southern States, in Table 2.2 for 11 North Central States, and in Table 2.3 for North Dakota and the Western States. Crop Reporting Board estimates as of July 1 are included for comparisons where such estimates are available. Sampling errors of estimates from the June Survey are included for selected items. A few crops such as corn, soybeans, and cotton were planted later than usual in many places so that a larger proportion than usual of the reported acres represented intentions. There is also a possibility that some growers in drought areas such as West Texas and Oklahoma reported cotton allotments instead of acreage actually planted because they expected to plow up the excess later.

Table 2.1--Acreage Estimates from June 1957 Research Surveys
and Comparisons, 12 Southern States

Crop	Crop Reporting Board July 1, 1957	Research Survey	
		Direct expansion	Sampling error
	Thous.	Thous.	Percent
Corn:			
Planted	16,260	15,873	3.8
For Grain	--	15,039	
Cotton, Planted	12,605	11,795	4.8
Winter Wheat for Harvest	7,477	8,376	9.2
Oats:			
Planted	9,162	9,030	6.2
For Grain	--	5,667	
Soybeans:			
Alone	4,493	4,138	
For Beans	4,005	3,785	
Sorghum:			
Planted	12,653	11,300	7.4
For Grain	--	9,659	
Tobacco, All	1,009	958	3.4
Peanuts, Planted	1,714	1,542	10.1
Hays:			
Lespedeza	2,723	2,372	6.9
Alfalfa	1,618	1,681	
Grain Hay	--	2,013	
Other Hay	--	6,256	
Number of Farms		1,693	
Number of segments	--	1,688	--

Table 2.2--Acreage Estimates from June 1957 Research Surveys and
Comparisons, 11 North Central States

Crop	Crop Reporting Board July 1, 1957	Research Survey	
		Direct expansion	Sampling error 1/
	Thous.	Thous.	Percent
Corn:			
Planted	51,186	53,630	5.3
For Grain	--	52,126	
Winter Wheat for Harvest	15,495	17,173	6.4
Spring Wheat	2,413	1,905	
Oats:			
Planted	26,894	26,879	5.0
For Harvest	--	25,985	
Soybeans:			
Alone	17,297	16,583	8.9
For Beans	16,970	16,533	
Sorghum:			
Planted	12,314	13,387	7.3
For Grain	--	12,003	
Barley:			
Planted	3,657	3,102	12.3
For Grain	--	3,006	
Hays:			
Alfalfa	18,789	17,575	
Clover	6,665	9,372	
Grain Hay	--	2,772	
Wild Hay	7,557	6,517	
Number of Farms		1,660	
Number of Segments	--	529	--

1/ 1956 Sampling Errors - These sampling errors were not recomputed because
the sample segments and design were practically identical in 1956.

Table 2.3--Acreage Estimates from June 1957 Research Survey
and Comparisons, 4 Western States and North Dakota

Crop	Crop Reporting Board July 1, 1957	Research Survey	
		Direct expansion	Sampling error
	Thous.	Thous.	Percent
Corn:			
Planted	2,093	2,924	14.2
For Grain	--	1,794	
Cotton, Planted	187	152	
Winter Wheat for Harvest	3,566	2,926	22.5
Spring Wheat 1/	9,039	8,635	9.9
Oats:			
Planted	2,810	2,889	11.4
For Harvest	--	2,597	
Soybeans:			
Alone	185	173	
For Beans	181	171	
Sorghum:			
Planted	1,778	2,959	
For Grain	--	2,318	
Barley			
Planted 1/	6,122	6,378	9.9
For Grain 1/	--	6,356	
Hays:			
Alfalfa	3,940	4,867	13.2
Clover 1/	614	666	
Grain Hay	--	1,295	
Wild Hay 1/	3,232	3,817	
Number of Farms		203	
Number of Segments	--	200	--

1/ Excludes New Mexico

The portion of the June questionnaire used to identify farm operators was handled incorrectly more often than any other section. Value of farm production was used as the criterion for identifying farms in the 1957 survey. The decision as to which place met the definition of a farm by that criterion was left up to the enumerator. This approach was less cumbersome than the one used in 1956 but the results obtained show clearly that many places that should have been classified as farms were passed over by enumerators. This is reflected in the low count of farm operators identified in 1957. And it also is substantiated by the comments of supervisors who reviewed the data and verified some of the field work. It appeared that enumerators did not investigate borderline cases as thoroughly as they should to determine whether or not the value of production was high enough to classify a place as a farm. In fact, that question seems to have been a convenient place for enumerators to conclude the interview when they were in a hurry to complete a segment. With some refinements the 1956 procedure of obtaining pertinent information about all respondents' operations, and having the statistician decide which places should be counted as farms, appears to be more satisfactory for maintaining year-to-year consistency in the farm count. Reference to money matters also seems to be undesirable from the standpoint of creating a favorable climate for conducting the rest of the interview.

2.4 Livestock, Dairy, and Poultry Estimates

These estimates are given in Table 2.4 for the Southern States and Table 2.5 for the North Central States and Table 2.6 for North Dakota and the 4 Western States. As livestock numbers were recorded by both the open-segment approach and the closed-segment approach, estimates for the various livestock species were made from both sets of reported data. The pig crop summaries were the first submitted by the States and hence contained a few more errors than were present in the summaries for the other livestock items that were submitted later. Data from the research surveys on the size of the spring crop and the expected farrowings during the ensuing 6 or 7 months were expanded as reported. They were not adjusted by any factor based on past relationships between reported intentions and actual farrowings.

Table 2.5--Livestock Estimates from June 1957 Research Surveys
and Comparisons, 11 North Central States

Item	Crop Reporting Board	Research Survey		
		Open segment	Closed segment	
		Direct expansion	Direct expansion	Sampling error
	Thous. head	Thous. head	Thous. head	Percent
Hogs and pigs:	:	:	:	:
All hogs and pigs	1/50,223	44,910	44,861	5.8
Hogs 6+	9,843	7,880	8,129	
Hogs 6-	1/40,380	37,030	36,732	
Sows farrowed (Dec.-June)	5,682	5,115	5,153	
Pigs saved	41,003	35,977	35,913	
Pigs per litter	7.22	7.03	6.97	
Sows to farrow (June-Dec.)	3,890	4,148	4,092	
Poultry:				
Hens & pullets of laying age	127,213	120,946	129,747	5.1
Commercial broilers	--	5,663	6,397	
All other chickens	--	135,236	138,742	
Cattle:				
Cows 2+	--	18,940	19,558	
Heifers under 2 yrs.	--	12,105	11,868	
Bulls, steers & steer calves	--	10,019	11,629	
All cattle	--	41,064	43,055	5.4
Calves born since 1/1/57	9,678	9,768	9,607	
Cows to calve before 1/1/58	6,683	8,074	8,241	
Cows milked yesterday	7,951	8,495	8,640	
Total milk cows	9,578	10,078	10,179	
Milk per cow in herd yesterday (lbs.)	25.7	25.9	26.0	
Sheep:				
Breeding ewes, 1+	--	6,150	6,806	10.1
All sheep & lambs	--	12,602	12,585	

1/ Board estimates are not available for Michigan and Nebraska. The indicated
numbers have been derived by assuming that the ratio of hogs 6+ to total
hogs and pigs is the same as for the other 9 States.

Table 2.6--Livestock Estimates from June 1957 Research Surveys
and Comparisons, 4 Western States and North Dakota

Item	Crop Reporting Board	Research Survey		
		Open segment	Closed segment	
		Direct expansion	Direct expansion	Sampling error
	Thous. head	Thous. head	Thous. head	Percent
Hogs and pigs:				
All hogs and pigs	--	972	1,003	21.4
Hogs 6+	206	156	165	
Hogs 6-	--	810	838	
Sows farrowed (Dec.-June)	124	114	118	21.7
Pigs saved	836	806	850	
Pigs per litter	6.74	7.09	7.18	
Sows to farrow (June-Dec.)	51	45	48	
Poultry:				
Hens & pullets of laying age	6,454	6,822	7,226	14.1
Commercial broilers	--	1,572	1,649	
All other chickens	--	6,752	7,220	
Cattle:				
Cows 2+	--	3,955	4,435	
Heifers under 2 yrs.	--	2,290	2,681	
Bulls, steers, & steer calves	--	2,194	2,949	
All cattle	--	8,438	10,066	11.8
Calves born since 1/1/57	3,093	2,687	3,710	11.6
Cows to calve before 1/1/58	746	730	759	
Cows milked yesterday	511	444	517	
Total milk cows	680	597	662	19.3
Milk per cow in herd				
yesterday (lbs.)	22.5	22.1	22.6	
Sheep:				
Breeding ewes, 1+	--	4,426	8,247	59.7
All sheep & lambs	--	7,422	16,009	57.8

Estimates of livestock numbers obtained by the open-segment or farm-headquarters approach are consistently lower than those from the closed-segment approach, as in the 1956 survey. Differences between the open and closed-segment data are not large in the North Central States but they are appreciable in the Southern and Western States. Although no systematic verification of reported livestock data was attempted in 1957, some verification was performed by supervisors during the survey when they had reason to suspect that enumerators were missing livestock. In 1956 it was fairly obvious from an inspection of the questionnaires that enumerators often recorded only a portion of the total livestock on the entire farm. In some cases enumerators recorded only the livestock on the entire farm that had not already been listed in the closed-segment part of the questionnaire. Other cases of under-enumeration occurred when enumerators did not bother to get the total number of head on the farm but recorded only the livestock inside the segment when filling out the entire-farm portion of the questionnaire. Where such errors were clearly identifiable, they were corrected in the editing. However, there is no way of knowing how many were not detected.

2.5 Acreage Verification

A sample quality check for content and coverage was conducted immediately following the enumeration. Since previous verification studies indicated that the largest errors were associated with misclassification of crops, the quality check consisted largely of verifying that the field was actually in the crop reported on the schedule. Supervisors revisited a sample of tracts as soon as possible after enumerator turned in the completed schedule for the segment.

Table 2.7 shows the number of tracts included in the quality check study and a summary of results for important crops. This check again indicated that misclassification of land use was the largest single source of error. It again pointed out the desirability of having enumerators make a visual check of fields in addition to questioning respondents in the interviews. It appears that this is not only desirable but necessary if response errors are to be kept at a low level. One of the largest errors uncovered resulted from the enumerator recording an intended use for a future year as the current use. While it appears that such an error obviously should not have been made during the interview, it is also clear that even the most casual inspection of the ground would have revealed the errors.

Table 2.7--Supervisors Acreage Verification Data 1/ Expressed
as Percent of June Enumeration Data

Crop	Southern States	North Central States	Western States
	Percent	Percent	Percent
Cotton	101.7	--	100.0
Corn	90.1	96.7	102.3
Soybeans	87.0	92.9	--
Tobacco	104.5	--	--
No. of Tracts	550	120	49

1/ Based on ground inspection of fields shown on photographs or sketches.

2.6 Segment Correlation -- June 1956 and June 1957

It was possible to compute correlations between segment totals for June 1956
and June 1957, since most of the sample segments enumerated in June 1956 were
retained in the 1957 sample. In the Southern States where the number of seg-
ments in 1957 was about two and one-half the June 1956 number, the June 1956
segments were retained and additional segments selected at random to obtain
the larger number used in 1957. In the North Central States the 1956 sample
was retained unchanged except for Nebraska, Kansas and South Dakota where a
few segments were added.

The correlations for a few crop items were lower than was expected. For
winter wheat and sorghums there were rather large shifts in acreage between
the two years. In 1957 a fairly large fraction of the wheat acreage was placed
in the Soil Bank. Such shifts in acreage generally resulted in a lower corre-
lation between the two years. Correlations were also computed for livestock
items by species and for hens and pullets of laying age. The livestock and
poultry correlations were somewhat higher than expected since it had been
assumed earlier that these were more likely to show year-to-year shifts. In
general, the correlations indicate that a significant reduction in sampling
error could be achieved by using year-to-year change indications in estimates
of crop and livestock items. Table 2.8 gives the correlations for selected
items.

Table 2.8--Segment Correlations for Selected Items on the
June 1956 and June 1957 Surveys

Item	12 Southern States	11 North Central States
Corn planted	.89	.93
Winter wheat for combining	.85	.68
Oats planted	.77	.85
Barley planted	--	.68
Sorghum planted	.98	.79
Cotton	.93	--
Tobacco	.67	--
Peanuts	.91	--
Soybeans	.83	.91
Lespedeza	.44	--
Alfalfa	--	.76
All cattle	.85	.88
All hogs & pigs	.81	.87
All sheep & lambs	.94	.84
Hens & pullets of laying age	.96	.81
Number of segments	473	477

3. October 1 Crop Production and Livestock Survey

3.1 Purpose

The October 1 survey was conducted to study possibilities of improving estimates of harvested crop acreages and yields of spring sown crops by interviewing a subsample of the tract operators. Information was also obtained on livestock and poultry inventories and on breeding intentions. The sample size varied between States. In the Western and North Central States one-eighth of the tracts were selected for this survey. In the Southern States one-twentieth of the tracts were selected in all States except North Carolina where only one-fortieth of the tracts were selected from those listed in Section 1 of the June Survey questionnaire. Field work was performed during September 23-30, thus coinciding with the objective yield work on corn, cotton, and soybeans in the States concerned. Conducting these jobs at the same time reduces costs because the work can be done by the same people with about the same amount of travel as for one survey alone. The objective yield work usually covered most of the State so that the additional travel and time chargeable to the October Interview Survey was not expected to increase costs more than 15-20 percent, except in a few States. In some States, additional enumerators were required to complete the work within the allotted time period.

The sampling units used in this survey consisted of individual operator tracts falling entirely within the boundaries of the sample segments enumerated in June. No data were obtained on agricultural operations outside the segment boundaries.

3.2 Crop Acreage and Production Estimates

The general compariability of the June and October data showed a marked improvement over the 1956 surveys. In practically all cases the October 1 schedules provided a complete accounting of the acreage planted or intended for a specified crop in June. The reporting of production by the growers in units of their own choosing was satisfactory, and differences in units used within a State did not appear to present any unusual problems. Providing the enumerator with acreage and land use data reported in June for each field and permitting the operator to report production in units of his own choosing apparently improved the comparability and reliability of the October data. While this did require some editing by the supervisor prior to listing to convert reported production to the same unit, that task seemed to be accomplished with fewer difficulties than were encountered in editing 1956 schedules. The overall quality of the enumeration was quite good. While the tract appeared to be quite efficient as a subsample unit, the sample was too small for a few crops to provide estimates of desired accuracy for harvested acres and yields.

The estimates of October 1 planted acres for each region were obtained by the following method. The reported October 1 and June data for the sample tract were weighted by district expansion factors used in June and added to State and regional totals. In the 8 North Central States which do not expand by crop reporting districts, the sample totals were expanded to State totals and added in with the other States to obtain regional totals. These October 1

totals were divided by their respective June totals to obtain ratios which were multiplied by the regional estimate of the June planted acres to obtain the October 1 estimate. Each October 1 utilization was expressed as a percent of the October 1 planted acres and multiplied by the October 1 planted acreage estimate to obtain the estimated acreage for each utilization. The acres, yield, and production for the three regions are given in Tables 3.1, 3.2 and 3.3.

Table 3.1--October 1 Research Surveys, Harvested Acreage and
Yields, 12 Southern States 1/

Crop and use	Research Survey				
	Ratio Oct. to June	Expanded acres	Yield per acre	Production	
				Quantity	Unit
	Percent	Thous.		Thous.	
Corn:					
Planted	93.6	14,651	--		
For Grain	--	13,391	32.3 bu.	433,000	Bu.
For Silage or Forage	--	176	5.7 tons		
For Grazing	--	527	--		
Other Acres	--	557	--		
Cotton:					
Planted	96.0	11,249	--		
Harvested	--	11,193	0.78 bale	8,730	Bales
Drowned out & plowed up	--	56	--		
Winter Wheat:					
For Grain	94.9	7,878	14.8 bu.	116,600	Bu.
For Hay		49	1.25 tons		
Other Acres		279	--		
Oats:					
Planted	98.8	8,907	--		
For Grain		3,037	24.8 bu.	75,300	Bu.
For Hay		2,343	0.71 tons		
For Grazing		2,592	--		
Failure & other uses		935	--		
Soybeans:					
Planted Alone	91.6	3,754	--		
For Beans	--	3,285	20.3 bu.	66,700	Bu.
For Hay	--	300	0.82 tons		
Other Acres	--	169	--		
Sorghums:					
Planted	109.8	11,978	--		
For Grain	--	8,984	30.3 bu.	272,000	Bu.
For Silage or Forage	--	1,246	2.6 tons		
For Grazing	--	1,330	--		
Other Acres	--	418	--		
Tobacco, All					
Planted	97.1	907	--		
For Harvest	--	898	1,373 lbs.	1,233,000	Lbs.
Plowed up & abandoned	--	9	--		

1/ Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia.

Table 3.1--October 1 Research Surveys, Harvested Acreage and
Yields, 12 Southern States 1/ (Continued)

Crop and use	Research Survey				
	Ratio Oct. to June	Expanded acres	Yield per acre	Production	
				Quantity	Unit
	Percent	Thous.		Thous.	
Peanuts:					
Planted	145.3	2,241	--		
For Nuts	--	1,977	676 lbs.	1,336,000	Lbs.
Hogged off	--	264	--		
Hays:					
Lespedeza, All	95.6	2,268	--		
Lespedeza Harvested	--	1,499	1.05 tons	1,570	Tons
Lespedeza Pastured	--	601	--		
Alfalfa, All	100.6	1,688	--		
Alfalfa Harvested	--	1,678	2.10 tons	3,520	Tons
Grain Hay, All	98.9	1,984	--		
Grain Hay Harvested	--	1,494	0.72 tons	1,080	Tons
Grain Hay Pastured	--	490	--		
Other Hays, All	87.0	5,427	--		
Other Hays Harvested	--	3,723	1.2 tons	4,470	Tons
Other Hays Harvested also for seeds	--	290	1.2 bu.		
Number of tracts selected	855				

1/ Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, North Carolina,
Oklahoma, South Carolina, Tennessee, Texas, and Virginia.

Table 3.2--October 1 Research Surveys, Harvested Acreage and
Yields, 11 North Central States 1/

Crop and use	Research Survey				
	Ratio Oct. to June	Expanded acres	Yield per acre	Production	
				Quantity	Unit
	Percent	Thous.		Thous.	
Corn:					
Planted	97.5	52,289	--		
For Grain	--	48,629	57.8 bu.	2,810,000	Bu.
For Silage	--	2,771	8.7 tons		
Other Uses	--	889	--		
Winter Wheat:					
For Grain	90.8	15,593	23.9 bu.	372,000	Bu.
For Hay	--	133	1.5 tons		
Other Acres	--	982	--		
Spring Wheat, All:					
Planted	97.7	1,861	--		
For Grain	--	1,861	22.4 bu.	41,700	Bu.
Oats:					
Planted	100.8	27,094	--		
For Grain	--	25,116	42.3 bu.	1,062,000	Bu.
For Silage	--	352	5.0 tons		
Other Acres	--	1,626	--		
Soybeans:					
Planted Alone	96.8	16,052	--		
For Beans	--	15,891	24.2 bu.	385,000	Bu.
For Hay	--	32	3.7 tons		
Other Acres	--	129	--		
Sorghums:					
Planted	100.4	13,441	--		
For Grain	--	10,014	32.9 bu.	329,000	Bu.
For Silage	--	1,398	8.4 tons		
Other Acres	--	2,029	--		
Barley:					
Planted	111.4	3,456	--		
For Grain	--	3,266	24.0 bu.	78,400	Bu.
For Grazing	--	190	--		

1/ Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska,
Ohio, South Dakota, and Wisconsin.

Table 3.2--October Research Surveys, Harvested Acreage and
Yields, 11 North Central States 1/ (Continued)

Crop and use	Research Survey				
	Ratio Oct. to June	Expanded acres	Yield per acre	Production	
				Quantity	Unit
	Percent	Thous.		Thous.	
Hays:					
Alfalfa, All	99.0	17,399	--		
Alfalfa Harvested	--	16,755	2.4 tons	40,200	Tons
Alfalfa Pastured	--	418	--		
Clover, All	101.3	9,494	--		
Clover Harvested	--	6,465	1.6 tons	10,300	Tons
Clover for Silage	--	313	7.6 tons		
Clover Pastured	--	1,339	--		
Grain Hay, All	83.8	2,600	--		
Grain Hays Harvested	--	2,181	1.35 tons	2,940	Tons
Grain Hays for Silage	--	37	1.0 tons		
Grain Hays Pastured	--	300	--		
Wild Hay, All	104.8	6,830	--		
Wild Hay Harvested	--	6,147	0.94 tons	5,780	Tons
Wild Hay Pastured	--	269	--		
Number of tracts selected	511				

1/ Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska,
Ohio, South Dakota, and Wisconsin.

Table 3.3--October 1 Research Surveys, Harvested Acreage and
Yields, 5 Western States 1/

Crop and use	Research Survey				
	Ratio Oct. to June	Expanded acres	Yield per acre	Production	
				Quantity	Unit
	Percent	Thous.		Thous.	
Corn:					
Planted	95.1	2,644	--		
For Grain	--	1,118	30.6 bu.	34,200	Bu.
For Silage	--	1,235	0.99 tons		
For Pasture	--	301	--		
Cotton:					
Planted, All	112.8	170	--		
Harvested, Short Staple	--	141	1.43 bales	202	Bales
Winter Wheat:					
For Grain	83.1	2,418	27.0 bu.	65,300	Bu.
Abandoned	--	76	--		
Spring Wheat, All 2/					
Planted	99.9	9,752	--		
For Grain	--	9,654	20.2 bu.	195,000	Bu.
For Hay	--	70	0.5 tons		
Abandoned	--	26	--		
Oats:					
Planted	102.3	2,911	--		
For Grain	--	2,684	36.7 bu.	98,500	Bu.
For Hay	--	168	1.2 tons		
Soybeans:					
Planted Alone	100.0	168	--		
For Beans	--	168	15.5 bu.	2,600	Bu.
Sorghums:					
Planted	61.5	1,679	--		
For Grain	--	997	26.0 bu.	25,900	Bu.
For Silage	--	32	0.90 tons		
For Hay	--	125	1.35 tons		
Other Acres	--	525	--		

1/ Colorado, Montana, New Mexico, North Dakota, and Wyoming.

2/ Excludes New Mexico.

Table 3.3--October 1 Research Surveys, Harvested Acreage and
Yields, 5 Western States 1/ (Continued)

Crop and use	Ratio Oct. to June	Expanded acres	Yield per acre	Production	
				Quantity	Unit
	Percent	Thous.		Thous.	
Barley:					
Planted 2/	96.2	6,077	--		
For Grain 2/	--	5,633	28.7 bu.	162,000	Bu.
For Hay 2/	--	61	0.5 tons		
For Pasture	--	3	--		
Hays:					
Alfalfa, All	95.6	4,551	--		
Alfalfa Harvested	--	4,333	1.8 tons	7,800	Tons
Alfalfa Pastured	--	118	--		
Clover, All 2/	83.7	577	--		
Clover Harvested 2/	--	462	0.9 tons	416	Tons
Clover Pastured 2/	--	100	--		
Grain Hay, All	108.8	1,421	--		
Grain Hay Harvested	--	1,275	1.61 tons	2,050	Tons
Grain Hay Pastured	--	94	--		
Wild Hay, All 2/	79.5	3,049	--		
Wild Hay Harvested 2/	--	2,839	0.90 tons	2,560	Tons
Number of tracts selected		213			

1/ Colorado, Montana, New Mexico, North Dakota, and Wyoming.

2/ Excludes New Mexico.

3.3 Livestock and Poultry Estimates

The livestock estimates given in the tables that follow have been computed by two methods. In method 1 the ratio of the expanded October total to the expanded June total for identical sample tracts for each specie total was used to obtain the change in the specie total by regions. Each sub-class for October 1 was expressed as a percent of the October 1 specie total. The percent in the October 1 sub-class was multiplied by the October 1 specie total to obtain the sub-class inventory number. For method 2 the ratio of the expanded October 1 sub-class number to the expanded June sub-class number was computed for identical sample tracts and used to obtain the change in the June 1 sub-class inventory. The mutually exclusive sub-class numbers were added to obtain the specie totals. In general, method 1 seems preferable. However, for sub-classes which remain fairly constant over time, such as milk cows, the sub-class ratios give just as reliable, or in some cases, more reliable estimates. The livestock estimates are given in Tables 3.4 and 3.5, 3.6 and 3.7.

Table 3.4--October 1 Research Surveys Livestock Estimates,
12 Southern States 1/

Item	Ratio Oct. 1: to June 1	Number 2/	Number 3/
	Percent	Thous. head	Thous. head
Cattle, All	77.1	25,480	26,220
Cows, 2 yrs.+	--	15,100	16,770
Cows and heifers, under 2 yrs.	--	6,160	6,100
Bulls and male calves	--	4,220	3,350
Milk cows in herd	--	5,510	5,490
Cows milked yesterday	--	3,100	3,090
Milk produced per cow in herd	--	19.1 lbs.	--
Cows to calve 6/1-1/1/58	--	6,440	6,510
Hogs, All	113.7	11,920	--
4 months and over	--	6,560	--
Under 4 months	--	5,360	--
Sows farrowed 6/1-12/1	--	1,430	1,270
Pigs saved per litter to 10/1	--	6.23	--
Sheep, All	74.6	7,480	7,400
Breeding ewes 1+	--	4,900	4,590
Chickens, All	103.1	4/131,040	4/ 130,650
Hens and pullets of laying age	--	73,560	72,290
Others	--	57,480	58,360
Eggs laid per 100 hens	--	42.4	--

1/ Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia.

2/ Each subclass estimated using percent of specie total.

3/ Ratios computed by subclasses and subclass estimates added to obtain specie total.

4/ The estimated numbers include approximately 2.9 percent non-farm chickens.

Table 3.5--October 1 Research Surveys, Livestock Estimates,
11 North Central States 1/

Item	Ratio Oct. 1: to June 1	Number 2/	Number 3/
	Percent	Thous. head	Thous. head
Cattle, All	89.8	38,660	38,680
Cows, 2 yrs.+	--	19,140	19,360
Cows and heifers, under 2 yrs.	--	10,590	10,250
Bulls and male calves	--	8,930	9,070
Milk cows in herd	--	9,390	10,560
Cows milked yesterday	--	6,840	7,690
Milk produced per cow in herd	--	18.5 lbs.	--
Cows to calve 6/1-1/1/58	--	7,210	8,870
Hogs, All	106.4	47,520	--
4 months and over	--	30,270	--
Under 4 months	--	17,250	--
Sows farrowed 6/1-12/1	--	3,930	4,290
Pigs saved per litter to 10/1	--	6.7	--
Sheep, All	107.6	13,540	13,690
Breeding ewes 1+	--	6,970	7,660
Chickens, All	73.5	197,240	193,930
Hens and pullets of laying age	--	154,680	150,120
Others	--	42,560	43,810
Eggs laid per 100 hens	--	44.3	--

1/ Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska,
Ohio, South Dakota, and Wisconsin.

2/ Each subclass estimated using percent of specie total.

3/ Ratios computed by subclasses and subclass estimates added to obtain specie
total.

Table 3.6--October 1 Research Surveys, Livestock Estimates,
5 Western States 1/

Item	:Ratio Oct. 1: to : June 1	Number 2/	Number 3/
	Percent	Thous. head	Thous. head
Cattle, All	113.8	11,330	11,400
Cows, 2 yrs.+	--	5,190	4,640
Cows and heifers, under 2 yrs.	--	2,890	3,060
Bulls and male calves	--	3,250	3,700
Milk cows in herd	--	1,010	711
Cows milked yesterday	--	540	379
Milk produced per cow in herd	--	12.3 lbs.	--
Cows to calve 6/1-1/1/58	--	1,280	873
Hogs, All	100.9	1,010	--
4 months and over	--	920	--
Under 4 months	--	90	--
Sows farrowed 6/1-12/1	--	87	13
Pigs saved per litter to 10/1	--	6.5	--
Sheep, All	79.7	12,830	12,830
Breeding ewes 1+	--	5,510	5,510
Chickens, All	72.2	10,260	10,610
Hens and pullets of laying age	--	7,210	7,770
Others	--	3,050	2,840
Eggs laid per 100 hens	--	40.8	--

1/ Colorado, Montana, New Mexico, North Dakota, and Wyoming.

2/ Each subclass estimated using percent of specie total.

3/ Ratios computed by subclasses and subclass estimates added to obtain
specie total.

Table 3.7--October 1 Research Survey, Percent of Fall
Farrowings by Months by Regions

Month	12 Southern States	11 North Central States	5 Western States
	Percent	Percent	Percent
June	16	7	31
July	19	16	34
August	14	26	0
September	13	20	9
October	10	19	0
November	28	12	26
Total	100	100	100

4. December 1 Crop Production and Livestock Surveys

4.1 Purpose

The December 1 enumerative survey was to provide data for estimating the fall and expected spring pig crops, planted acreages of fall sown grains, and January 1 numbers of livestock and poultry. In addition it was to provide more complete information on harvested acres and final yields of fall harvested crops. The post-harvest objective yield work was to be completed, in most cases in connection with this survey. The post-harvest interview made in connection with the objective yield work, obtained growers' reports of production for the sample fields. Objective field gleanings were also made in sample fields used in the objective yield work which had been harvested by this time.

The December 1 Interview Survey sample was composed of an entirely different set of tracts from those used in the October 1 survey. It was generally about twice as large as the October 1 sample. However, the sample tracts were chosen in clusters of two, so travel would be increased very little over the October 1 survey requirements. The survey was conducted between November 25 and December 4. In addition to obtaining information for the sample tracts, some information was obtained for entire farms. When a farm operator resided in the tract, the farm headquarters or "open-segment" method was used to obtain data on livestock sales, purchases, and slaughter that could not be obtained conveniently by the closed-segment approach. The information was needed to project December 1 inventories to a January 1 date.

4.2 Crop Acreage and Production Estimates

The June-December data showed the same high degree of comparability as the June-October data. In practically all cases, the December schedule provided a complete accounting of the acres planted or intended for the specific crop at the time of the June Survey. Growers estimated yields differed somewhat from those reported in October as did the crop utilizations. However, these differences tended to reflect changes in yield prospects and intended utilization as well as sampling variations. For several crops the changes indicate that the grower did not know his production or that there was a misunderstanding of what was desired either on the part of the enumerator or the respondent.

The cotton yield reported by growers on December 1 is considerably below that indicated by Census ginnings and other check data. The December 1 reported cotton yield has shown this bias consistently in the past.

The summarization of grain hays and other hays in both the June and December surveys would be improved if the hays in these two categories were reported by kinds since what is called grain hay and other hay varies from grower to grower and by States. Duplication in acres reported separately as oats utilized for hay and acres reported for grain hay could be avoided by checking the segment tract and field codes.

The estimated acres for several important items, such as winter wheat, corn, soybeans and cotton, were computed by States from a ratio estimator and added to obtain regional totals. Sample totals for other items were pooled at the regional level and the regional ratio or percentage change from June was used for the December expansions. For the 4 crops mentioned, the sample was large enough to compute estimates for individual States with the ratio estimator. The regional estimate derived from these individual State expansions may have a smaller sampling error than the pooled estimate for these items. However, where States have only a few sample segments, the pooled estimate is likely to be better since bias in the ratio estimator is reduced. The estimates are given in Tables 4.1, 4.2, 4.3, and 4.4 for the crop items.

Table 4.1--December 1 Research Surveys, Acreages of
Fall-Sown Small Grains for all Purposes

1958 Crop	Region		
	12 Southern States	11 North Central States	5 Western States
	Thous.	Thous.	Thous.
Wheat	9,040	23,204	4,813
Rye	1/ 1,120	1/ 1,908	1/ 262
Oats	1/ 9,108	1/ 766	1/ 9
Barley	1/ 1,623	1/ 1,986	1/ 552
Number of tracts selected	1,610	1,022	426

1/ Ratio expansion derived as follows:

$$\frac{(\text{Dec. 1 Expanded "Crop" Acres for Tracts})}{(\text{Dec. 1 Expanded Wheat Acres for Tracts})} \times (\text{June 1 Total Wheat Acres})$$

This ratio was used because these crops were not listed or summarized in June in all States.

Table 4.2--December 1 Research Surveys, Harvested Acres and
Yields for Selected Crops, 12 Southern States

Crop	Expanded acres	Yield per acre	Production Quantity	Unit
	Thous.		Thous.	
Corn:				
Planted	14,978			
For Grain	12,627	28.5	359,700	Bu.
Cotton:				
Harvested	11,060	.634	7,020	Bales
Winter Wheat:				
For Grain	7,610	15.4	117,200	Bu.
Oats:				
For Grain	3,009	29.8	89,700	Bu.
Soybeans:				
Planted Alone	3,666			
For Beans	3,296	21.9	72,300	Bu.
Sorghums:				
Planted	10,885			
For Grain	7,590	27.1	206,000	Bu.
For Silage or Forage	1,175	1.25	1,470	Tons
Tobacco, All				
Harvested	904	1,490	1,346,000	Lbs.
Peanuts:				
For nuts	1,312	917	1,203,000	Lbs.
Hays:				
Lespedeza, cut	1,464	1.22	1,780	Tons
Alfalfa, cut	1,446	2.27	3,280	Tons
Grain Hay, cut	1,830	1.16	2,130	Tons
Other Hays, cut	1/ 6,019	1.10	6,650	Tons

1/ Includes Sudan, Millet, Sweet Clover, Native Grasses, Peanuts, Soybeans,
Sorghums, and all other hays not reported elsewhere.

Table 4.3--December 1 Research Surveys, Harvested Acres and
Yields for Selected Crops, 11 North Central States

Crop	Expanded acres	Yield per acre	Production Quantity	Production Unit
	Thous.		Thous.	
Corn:				
Planted	51,424			
For Grain	46,848	60.3	2,825,000	Bu.
Winter Wheat:				
For Grain	15,206	23.6	359,000	Bu.
Spring Wheat:				
For Grain	1,692	21.9	37,100	Bu.
Oats:				
For Grain	25,125	42.5	1,067,800	Bu.
Barley:				
For Grain	2,773	19.3	53,500	Bu.
Soybeans:				
Planted	15,838			
For Beans	15,018	25.2	378,300	Bu.
Sorghums:				
Planted	12,637			
For Grain	9,101	26.0	236,600	Bu.
For Silage or Forage	2,095	5.91	12,400	Tons
Hays:				
Alfalfa, cut	16,103	2.58	41,500	Tons
Clover, cut	7,037	1.73	12,200	Tons
Grain and other tame hays, cut	2,728	1.20	3,270	Tons
Wild Hays, cut	4,986	0.955	4,760	Tons

Table 4.4--December 1 Research Surveys, Harvested Acres and
Yields for Selected Crops, 5 Western States

Crop	Expanded acres	Yield per acre	Production Quantity	Unit
	Thous.		Thous.	
Corn:				
Planted	2,772			
For Grain	1,491	33.8	50,400	Bu.
For Silage	635	7.4	4,700	Tons
Winter Wheat:				
For Grain	2,316	32.7	75,700	Bu.
Spring Wheat:				
For Grain	9,662	16.4	158,100	Bu.
Oats:				
For Grain	2,757	20.8	57,400	Bu.
Barley:				
For Grain	5,779	27.0	156,033	Bu.
Sorghums:				
Planted	2,814			
For Grain	1,025	13.2	13,500	Bu.
Hays:				
Alfalfa, cut	4,754	1.90	9,030	Tons
Clover, cut	507	1.70	860	Tons
Grain Hay, cut	1,495	1.08	1,610	Tons
Wild Hay, cut	3,127	0.78	2,440	Tons

4.3 Livestock and Poultry Estimates

The livestock and poultry estimates were made by the same two methods used for the October 1 survey. Method 1 involves making the ratio estimate of the change in the specie total and then breaking the sub-classes down on the basis of the ratio of the December 1 sub-class total to the December 1 specie total. Method 2 involves making separate ratio estimates for each of the mutually exclusive sub-classes and adding them to obtain the specie total. For a few of the sub-class items, as well as for some of the acreage items, a ratio expansion could not be made because the June total was zero. In these cases, a direct expansion was made of the December 1 data. Since a one-fourth subsample was taken in the North Central and Western States the June expansion factor was multiplied by 4 to obtain the December 1 expansion factor. In the Southern States, where a one-tenth subsample was taken, the June expansion factor was multiplied by 10. A summary of the results for the three regions is given in Table 4.5.

Table 4.5--December 1, 1957 Livestock and Poultry Data

Item	12 Southern States		11 North Cent. States		5 Western States	
	Number (% of total)1/	Number (% by sub-classes)2/	Number (% of total)1/	Number (% by sub-classes)2/	Number (% of total)1/	Number(% by sub-classes2/
	Thous.	Thous.	Thous.	Thous.	Thous.	Thous.
Cattle, All	27,293	27,219	46,801	45,257	8,462	8,377
Cows, 2 yrs.+	16,895	16,482	20,311	22,120	4,916	4,766
Cows, under 2	5,895	5,846	13,198	13,194	2,073	2,068
Bulls & male calves	4,503	4,891	13,291	9,943	1,472	1,543
Milk cows in herd	3,521	4,371	10,390	11,502	787	692
Cows milked yesterday	2,129	2,627	7,114	8,096	482	405
Milk produced per cow in herd yesterday	10.3 lbs	--	17.1 lbs.	--	15.3 lbs	--
Calves born 6/1-12/1	5,019	--	6,109	--	77	--
December calves	1,689	--	2,059	--	17	--
December purchases	1,175	--	3,240	--	76	--
December sales	1,115	--	1,550	--	180	--
December farm butcher	203	--	235	--	29	--
Hogs, All	12,402	--	46,019	--	1,161	--
6 months +	5,134	--	18,868	--	672	--
Under 6 months	7,268	--	27,151	--	489	--
December farrowings	118	--	560	--	14	--
December purchases	136	--	2,087	--	12	--
December sales	1,666	--	9,259	--	216	--
December farm butcher	1,289	--	476	--	60	--
Spring farrowings '58	1,215	--	5,982	--	82	--
Sheep, All	3/ 7,878	3/ 7,908	10,120	10,172	14,398	14,421
Breeding ewes 1+	5,993	6,043	7,799	5,855	7,646	7,189
December lambs	1,131	--	491	--	0	--
December purchases	45	--	1,238	--	32	--
December sales	138	--	972	--	0	--
December farm butcher	55	--	0	--	7	--
Sheep shorn in 1957	5,585	--	9,800	--	14,011	--
Wool per sheep shorn	7.68 lbs	--	7.19 lbs.	--	10.0 lbs	--
Chickens, All	102,474	107,206	176,545	174,555	9,568	10,598
Hens & pullets of laying age	82,449	89,060	166,526	164,493	8,718	9,834
Pullets not laying	15,021)	18,146	5,592)	10,062	600)	764
Other chickens	5,004)		4,427)		250)	
Eggs per 100 hens yesterday	33.7	--	46.1	--	21.4	--

1/ Each sub-class estimated using percent of specie total.

2/ Ratios computed by sub-classes and sub-class estimates added to obtain specie total.

3/ One segment which was edited out would double the number indicated.

5.   1957 Objective Cotton Yield Surveys

5.1   Procedures and Sample Design

A sample of about 1,000 fields was selected, with a minimum of 70 being allotted to a State, so the sample would be sufficiently large by States to detect differences between States with respect to plant behavior.   In California, Arizona and New Mexico, 110 fields were allotted to study the behavior of plants on irrigated land.   Within each State, fields were selected with probabilities proportional to size (acres) from information recorded in the June Interview Survey.   The first visit to the sample field was made as of August 1, at which time the grower was also interviewed, and observations were made again as of September 1 and October 1.   A post-harvest survey was made after harvest time to interview the farmer and to obtain gleaning data on the sample field.

As in previous years, two sample plots, each consisting of a double 10-foot row section, were selected for observation in each field.   The plots were located by pairs of numbers representing the number of rows to be counted along the edge of the field and the number of steps or paces to be taken into the field.   When there was no definite pattern of rows in a field, or when it was impossible to count rows, an equal number of paces was substituted for a row count.   The number of fields selected in each State and the number on which observations were made on each visit are shown in Table 5.1.

Table 5.1--Number of Cotton Fields Selected by States

State	Number selected	Number in which counts were made			
		Aug. 1	Sept. 1	Oct. 1	Post-harvest
Ala.	70	70	70	70	58
Ark.	125	113	114	114	25
Ga.	70	69	69	69	53
La.	70	69	68	68	23
Miss.	125	120	116	117	33
N. C.	70	68	68	68	52
Okla.	70	61	60	60	29
S. C.	70	69	69	62	59
Tenn.	70	69	69	68	59
Tex.	250	231	215	189	152
Ariz.	30	28	26	27	29
Calif.	50	50	50	46	28
N. Mex.	30	30	30	30	19

5.2 August 1 Survey

The operator was interviewed at this time to obtain information for the sample fields. The interview provided information on the acres for harvest, and the grower's appraisal of prospective yield. The pertinent results are summarized along with the June planted acreage data in Table 5.2 for the 10 Southern States. The June survey was not conducted in Arizona and California.

Table 5.2--Acreage and Prospective Production Data
Reported by Growers

State	June planted acres	August 1 standing acres	Aug. 1 acres: intended for harvest	Forecast of yield per acre	Production (500 lbs. gross bales)
	Thous.	Thous.	Thous.	Pounds	Thous.
Ala.	908	899	899	508	951
Ark.	1,108	928	928	452	874
Ga.	588	578	577	552	664
La.	423	411	408	456	387
Miss.	1,370	1,332	1,332	488	1,354
N. C.	270	252	245	564	288
Okla.	437	381	381	218	173
S. C.	500	488	487	483	490
Tenn.	544	513	493	485	498
Tex.	5,551	5,115	5,078	411	4,348
10-States	11,699	10,897	10,828	444	10,027

In addition to the above data, the enumerator secured certain information on the application of insecticides before proceeding to the sample field. If hazardous insecticides, particularly those with phosphoric content, had been applied within the past week the enumerator was instructed to wait two full days after the application before entering the field.

After the interview was completed, two plots were selected in the sample field. Each plot consisted of 20 feet of row composed of two 10-foot sections in adjacent rows on which large boll counts were obtained. Detailed counts were also made on two hills beyond each of the two plots so the small bolls, blooms, and squares could be estimated. In addition, bolls and blooms were tagged so the survival of these fruit could be studied. Counts on these plants were used to estimate the numbers of such fruit per 40 feet of row, using the relationship of the counts to the large-boll count, or the per-plant average when the large-boll count was extremely low, as the basis for the expansion. The counts per 40 feet of row are shown in Table 5.3 and the counts are converted to a yield per acre in Tables 5.4 and 5.5 based on the regional forecasting model developed from experience in the 10 Southern States.

Table 5.3--August 1, 1957 Counts per 40 Feet of Row

State	: Average : row : spacing	Fruit per 40 feet rows				: Percent : of full : load	: Total : fruit : load
		Large bolls	Small bolls & blooms	Squares	Total fruit		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ala.	3.25	148	182	429	761	96.4	789
Ark.	3.17	32	87	462	580	74.8	776
Ga.	3.14	237	140	267	644	97.5	661
La.	3.54	160	173	593	927	97.1	955
Miss.	3.31	129	174	789	1,091	93.2	1,169
N. C.	3.43	130	242	690	1,063	93.4	1,138
Okla.	3.30	0.2	13	202	215	37.7	570
S. C.	3.26	211	148	264	624	97.1	643
Tenn.	3.18	37	123	470	631	85.5	738
Tex.							
East	3.17	124	74	174	373	78.8	473
West	3.67	2	26	490	518	39.2	1,321
10-States	3.35	85	95	435	615	71.5	860

Table 5.4--August 1 Distribution of Fields by Maturity
Categories and Computation of Bolls Expected per 40 Ft. of Row

State	Percent of fields by maturity classes			:Percent: full : load	Fruiting rate			:Bolls: to : come	:Bolls: set	:Total :bolls :ex- :pect.
	:Large :bolls	:Sm. bolls : & blooms	:Squares &: no fruit		:Percent :(2)+(3)	:Relative: weekly : rate	:Fruit: per : week			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)			
Ala.	88.6	10.0	1.4	96.4	11.4	0.019	15	-38	330	292
Ark.	44.2	33.6	22.2	74.8	55.8	.093	72	272	119	391
Ga.	89.9	10.1	0	97.5	10.1	.017	11	-67	377	310
La.	83.4	11.6	0	97.1	11.6	.019	18	120	333	453
Miss.	83.3	11.7	5.0	93.3	16.7	.028	32	186	303	489
N. C.	79.4	17.7	2.9	93.4	20.6	.034	39	76	372	448
Okla.	1.6	29.5	68.9	37.7	98.4	.164	93	150	13	163
S. C.	88.4	11.6	0	97.1	11.6	.019	12	-60	359	299
Tenn.	56.5	36.2	7.3	85.5	43.5	.072	54	243	160	403
Tex.										
East	59.8	18.5	21.7	78.8	40.2	.067	32	50	198	248
West	2.2	27.3	70.5	39.2	97.8	.163	215	315	28	343
10-State Region	48.5	21.3	30.2	71.5	51.5	0.086	74	162	180	342

Table 5.5--August 1 Yield Forecast

State	Total bolls expected per 40 feet of row	Average boll weight	Weight of seed cotton per 40 feet of row	Conversion factor: Grams seed cotton to pounds of lint per acre	Gross yield of lint per acre	Net yield
	Number	Grams	Grams		Pounds	Pounds
Ala.	292	5.12	1,498	0.2735	410	369
Ark.	391	4.84	1,892	.3800	530	477
Ga.	310	5.03	1,557	.2830	441	397
La.	453	5.04	2,283	.2511	573	516
Miss.	489	4.84	2,367	.2675	633	570
N. C.	448	4.73	2,120	.2590	549	494
Okla.	163	4.75	774	.2688	208	187
S. C.	299	4.80	1,435	.2724	391	352
Tenn.	403	4.90	1,975	.2785	550	495
Tex.						
East	248	4.00	990	.2799	277	249
West	343	4.95	1,698	.2420	411	370
10-State Region	342	4.75	1,625	0.2648	432	389

5.3 September 1 Survey

In this survey plant observations were made on the same plots that were laid out at the time of the August 1 survey. The grower was not interviewed for this survey except where the previous contact indicated that a fresh application of some hazardous insecticide might have been made. The plant observations were the same as those made a month earlier except for a few modifications necessitated by the more advanced stage of development of the crop.

Open cotton in sample plots was picked and weighed and a handful of the seed cotton from each row was placed in a moisture-proof bag and carried or mailed to the State office to be weighed before and after drying to determine the moisture percentage. The samples for all fields worked by an enumerator were composited and weighed before drying. The cotton was then spread out to dry at room temperature for a week, but was reweighed after 3 days and 7 days to determine the moisture loss.

The pertinent data collected in this survey are shown in Table 5.6 along with the computed yield per acre. In several States the individual plant counts made on plants beyond the row sections indicated a much greater number of bolls than counted in the row sections. This seemed to be expecially noticeable in areas where late fruiting was fairly heavy. Such differences may have been the result of the enumerators overlooking small plants with few or no fruit and selecting sample plants which had a larger number of fruit, or counting plants in the row section differently than when counting plants for selecting plants beyond the unit. In these cases the total boll counts appeared to be approximately 10-20 too high.

Table 5.6--September 1, 1957 Cotton Yield Survey

State	Fruit per 40 feet row				Total bolls ex-pected	Aveg.: boll weight	Weight: of seed: cotton: per 40 ft.	C. F.	Yield	
	Burrs (bolls picked earlier)	Large open & unopened bolls	Small bolls and blooms	Total bolls					Gross	Net
Ala.	11	273	47	331	331	4.59	1,519	0.2735	415	374
Ark.	0	263	179	442	442	1/4.70	2,139	.2800	599	539
Ga.	61	224	9	294	294	5.01	1,473	.2830	417	375
La.	30	350	90	470	470	4.92	2,312	.2511	581	523
Miss.	7	363	182	552	552	1/4.84	2,672	.2675	715	644
N. C.	0	301	67	368	368	4.02	1,479	.2590	383	345
Okla.	0	79	109	188	188	1/4.75	893	.2688	240	216
S. C.	23	276	23	322	322	4.28	1,378	.2724	375	338
Tenn.	1	275	118	394	394	1/4.80	1,891	.2785	527	474
Tex.State	36	119	157	312	312	4.63		.2571	372	335
East	85	117	71	273	273	4.23	1,155	.2799	323	291
West	0	120	217	337	337	1/4.95	1,668	.2420	404	364
10-State Region	24	202	132	360	360	4.72	1,739	0.2648	450	405

1/ Average for 1954, 1955, 1956 and 1957 seasons.

Table 5.7--Coefficient of Variation 1/for Large Bolls
Counted per 40 Feet of Row - September 1, 1957

State	Coefficient of variation	Sampling error of mean
	Percent	Percent
Ala.	37	4.4
Ark.	62	5.8
Ga.	45	5.4
La.	42	5.1
Miss.	46	4.3
N. C.	48	5.8
Okla.	75	9.7
S. C.	46	5.5
Tenn.	55	6.6
Tex.		
East	70	7.4
West	72	6.1
10-State	47	1.6

1/ Computed by use of order statistics as described in July 1956 issue
of Agricultural Economics Research.

5.4 October 1 Survey

A third visit to the sample field was made as of October 1 and plant observations were made on the sample plots. The main purpose of this survey was to count the bolls present on the plants and to obtain weights of open cotton. The fruit counts are summarized in Table 5.8 along with the yield per acre computations. The net yield in the last column was derived from the gross yield by assuming a 5.0 percent loss due to cotton being missed in picking or opening after the cotton was picked. In general, harvesting operations carried out under typical fall conditions after October 1 result in a normal loss of about 5 percent. The computations of yield in Table 5.8 are based on the average boll weight for the season.

Table 5.8--October 1, 1957 Cotton Yield Survey

State	Fruit per 40 ft. of row			Average: boll weight for season	Weight: of seed cotton per 40 feet	C. F.	Gross yield	Net yield 1/	Board Dec. 1
	Burrs (bolls picked earlier)	Large open & unopened bolls	Total large bolls						
Ala.	128	166	294	4.73	1,391	0.2735	380	361	346
Ark.	48	342	390	4.59	1,790	.2800	501	476	418
Ga.	213	59	272	4.97	1,352	.2830	383	364	333
La.	154	256	410	5.02	2,058	.2511	517	491	398
Miss.	60	375	435	4.98	2,166	.2675	579	550	417
N. C.	51	252	303	4.50	1,364	.2590	353	335	325
Okla.	2	182	184	4.87	896	.2688	241	229	218
S. C.	183	117	300	4.50	1,350	.2724	368	350	333
Tenn.	18	319	337	5.55	1,870	.2785	522	498	424
Tex.	66	209	275	4.74	1,303	.2571	335	318	291
East	147	71	218	4.50	981	.2799	275	261	
West	0	313	313	2/4.95	1,549	.2420	375	356	
10-State Region	73	239	312	4.83	1,507	0.2648	399	379	331

1/ Gross yield less a 5 percent harvesting loss.

2/ Average for all years.

5.5 Post-harvest Surveys

The interview information is summarized in Table 5.9. The growers reported that practically all acreage standing on August 1 was harvested even though the harvest was delayed due to unfavorable fall weather. The growers' post-harvest yield per acre of 341 pounds for the 10 Southern States is 10 percent below the October 1 objective yield indication, and 3 percent above the Crop Reporting Board December 1 yield per acre. The growers' estimate of seed cotton left in the field after harvest was 22 pounds per acre, which is slightly less than the 25 pounds reported in 1956. It seems likely that growers under-estimate the cotton left in the field after harvest since this is equivalent to only 8 and 9 pounds of lint per acre. The numbers of sample fields harvested by various methods are shown in the last 7 columns.

The post-harvest gleaning data are given in Table 5.10. For the 10 States the number of large open and unopened bolls found (31.0) was about 20 percent greater than the number found in 1956. The number of other bolls dried up or damaged (38.0) so no cotton could be realized from them was slightly higher than found in 1956. The unopened bolls and other bolls which were expected to produce no cotton were assumed to have the same cotton potential as the open bolls which would make the total loss per sample $(26.8 + 4.2 + 38.0)(106.3/26.8) =$ 273.7 grams of seed cotton. This weight of seed cotton is equivalent to 195.9 pound of seed cotton per acre or 72.5 pound of lint per acre. This is 18.2 percent of the total potential indicated on October 1 and almost double the average percentage loss found in the previous three years. A harvesting loss of 5 percent based only on the equivalent weight of cotton for the large bolls found in the gleaning surveys has been assumed for the October 1 forecast. The large open and unopened bolls found in 1957 gleanings indicated a weight of cotton equal to 8.2 percent of the October 1 total potentials.

Table 5.9--Post-harvest Interview Data for Sample Fields

State	Reported Aug. 1 acres standing	Per-cent of acres harv.	Yield in lbs. of lint per acre	Lbs. of lint per bale	Esti. of seed cotton left per acre	Fields in sample	Fields with 2 or more methods	Methods of harvest				
								Hand			Machine	
								Picked	Snapped	Picked	Snapped or picked	Gleaned or later by hand
Ala.	777.2	100.0	360	502.0	22	67	11	62	11	5	0	0
Ark.	2,644.2	101.6	422	494.0	28	93	9	85	3	14	0	4
Ga.	774.1	99.2	370	504.0	25	64	1	64	1	0	0	0
La.	859.4	99.1	413	491.1	19	61	12	49	6	16	2	2
Miss.	1,721.0	98.7	398	496.0	16	93	6	83	7	9	0	1
N. C.	341.8	100.1	346	479.7	29	64	0	62	0	2	0	1
Okla.	789.4	101.6	187	505.1	10	42	18	6	26	0	28	2
S. C.	625.5	98.5	326	492.5	18	68	0	68	0	0	0	3
Tenn.	689.8	98.1	427	506.0	10	67	4	64	5	2	0	1
Tex.		98.7	303	494.5	25	229	94	49	152	11	111	7
East	2,851.9	97.7	226	483.4	25	93	17	24	68	3	15	1
West	10,942.0	99.4	355	501.8	24	136	77	25	84	8	96	6
10-State Region	--	99.2	341	496.1	22	848	155	592	211	59	141	21

Table 5.10--Post-harvest Gleaning Data per 40 Feet
of Row Plus Middle

State	Fields gleaned	Open bolls	Large unopened bolls	Other bolls dried up or rotten	Seed Cotton			
					In open bolls	Found loose	Total field weight	Total dry weight
	Number	Number	Number	Number	Grams	Grams	Grams	Grams
Ala.	57	29.9	0.6	45.9	85.1	44.0	129.1	102.5
Ark.	25	40.8	2.0	53.4	101.5	95.9	197.4	159.1
Ga.	52	31.8	0.2	26.3	64.8	21.3	86.1	73.4
La.	23	12.3	1.1	26.2	16.9	12.7	29.6	27.0
Miss.	33	16.1	0.1	66.2	36.2	34.2	70.4	54.7
N. C.	52	67.2	2.0	245.3	105.4	58.7	164.1	133.2
Okla.	25	7.7	2.8	13.5	39.6	15.7	55.3	52.4
S. C.	59	30.8	2.1	27.6	53.6	26.5	80.1	71.5
Tenn.	58	19.4	1.3	27.7	51.5	11.3	62.8	44.0
Tex.	186	27.0	7.6	22.3	101.8	35.6	137.9	133.2
East	73	19.4	2.2	17.2	47.6	27.4	75.0	
West	113	32.0	11.2	25.6	137.6	41.0	178.6	
10-State Region	570	26.8	4.2	38.0	80.6	38.2	118.8	106.3

5.6 Discussion and Analysis of Yield Data

In 1956 and 1957 a regional model was used to compute a yield per acre for
each State. It was not expected that these yields would agree with current
Board yields adopted by States for several reasons: (1) The June Survey was
still on too small a scale to insure that the sample of cotton fields would
represent the State, and (2) the parameters used in the regional model were
expected to vary from State to State. Furthermore, the computations of yields
by States were not expected to result in any improvement in the average regional
yield, but was expected merely to facilitate the detection of those States in
which the forecasting model might require substantial modifications.

The forecasting problems on the three survey dates differ substantially,
but the procedures which have been developed are concerned primarily with the
following considerations - On August 1, the prediction of the additional bolls
to be formed, based on the rate of fruiting indicated on August 1; on September 1,
forecasting the fraction of the total bolls present which could be expected to
mature by harvest; and on October 1, forecasting the fraction of large bolls
present which would not be harvested.

August 1 Forecast:

The techniques for translating fruit counts into yield forecasts are summarized in Tables 5.3, 5.4 and 5.5. The approach makes use of data on stage of maturity, plant capacity and rate of fruiting. This approach is sufficiently flexible to be adaptable to individual States. However, such parameters as the fruiting rate and its relationship to the additional bolls set may be expected to vary from State to State, or for groups of States within the region. An examination of the August 1 and September 1 total boll counts reveals that for Alabama, Georgia, North Carolina, and South Carolina, the bolls present on August 1 represent the maximum. For this group of States, the September 1 boll count is generally lower than the August 1 count. In general, these States are characterized by a somewhat lower fruiting rate and a relatively lower yield per acre. For this group of States, it appears that the August 1 forecast procedure for the region as a whole should be modified so that it will be essentially the same as for September 1. That is, a 10 percent harvesting loss applied to the August 1 boll count would appear to be a realistic estimate of the bolls that will reach the gin. However, this should not be interpreted as meaning that none of the squares present on August 1 will produce cotton. In fact, a large portion of the squares actually do produce cotton but they are offset by a corresponding shedding of small bolls and some large bolls which were present on August 1. The regional model appears to be satisfactory for the remaining States, except that Oklahoma and East Texas appear to have a somewhat lower fruiting rate than the other States in the group.

In an effort to take these factors into consideration the States were divided into 2 sub-groups. Group 1 was comprised of Alabama, Georgia, North Carolina, South Carolina, Oklahoma and East Texas, and the second group was comprised of Arkansas, Louisiana, Mississippi, Tennessee and West Texas. The 1956 and 1957 data on rate of fruiting and the additional bolls set between August 1 and September 1 were studied so relationships could be constructed for these two sub-groups. Table 5.11 indicates the nature of this relationship for the two sub-groups.

While the weight of seed cotton per boll appears to be related to the maximum fruit load on a regional basis, it has not been possible as yet to identify a similar relationship for individual States. The historical average weight per boll appears to be the best weight available for individual States at the time of the August 1 forecast. However, an attempt is being made to develop a method of adjusting the historical averages upward a constant percent for all States indicating above-average fruiting loads and making a downward adjustment for those States indicating below-average fruiting loads. Results of this study have not been completed to date.

Table 5.11--Relationship Between Change in Boll Count by Sub-Groups
of States, August 1 to September 1, and August 1 Computed
Fruiting Rate (per 40 Feet of Row)

Computed weekly fruiting rate August 1	Group I Southeastern States, Oklahoma, East Texas Change in boll count August 1-September 1	Group II Delta States and West Texas Change in boll count August 1-September 1
Number fruit	Number bolls	Number bolls
5	--	0
10	-75	+60
20	0	+135
30	+42	+180
40	+80	+210
50	+105	+235
60	+125	+255
70	+140	+270
80	+145	+280
90	+150	+288
100	+150	+295
125	--	+303
150	--	+310

Group I: N. C., S. C., Ga., Ala., Okla., East Texas.

Group II: Ark., Miss., La., Tenn., West Texas.

September 1 Forecast:

By September 1 the total bolls present account for all the bolls which may be expected to mature in the rainfall portion of the Cotton Belt. In Alabama, Georgia, North Carolina, and South Carolina, the large bolls present are equal to, or exceed, the number eventually ginned. While some of the small bolls present in these States will mature, they in effect only offset large bolls shed or knocked from the plants during the first or second pickings. In the remaining States a fairly large fraction of the small bolls mature and are harvested. The fractions of small bolls and blooms which, in addition to the September 1 large bolls, are required on the average to account for the total large bolls present (or previously picked) on October 1 are given in Table 5.12.

Table 5.12--Fraction of September 1 Small Bolls and Blooms Required to Account for the Difference Between the September 1 Large Boll Count and the October 1 Large Boll Count - 1955, 1956 and 1957 seasons

State	Fraction of September 1 small bolls and blooms
Ala.	0.37
Ark.	.56
Ga.	0
La.	.59
Miss.	.40
N. C.	.26
Okla.	.92
S. C.	.27
Tenn.	.64
Tex.	.80

The fraction of total September 1 bolls which will be present on October 1 can be derived from Table 5.12. The wide range in the value for the fraction of small bolls required to account for the October 1 large bolls suggests that the regional formula can be modified so that more realistic State yields can be computed on September 1. This modification by States in the regional formula, it is believed, may also result in some improvement at the regional level.

The weight of seed cotton per boll in past years for September 1 has agreed rather closely with the final weight per boll for the region as a whole. However, for individual States there has been considerable variability between the September 1 boll weight and the final weight per boll. This trend in boll weight has been investigated to some extent and indicates that there are probably at least two sub-groups of States which behave similarly with respect to trend in boll weight. In group 1, consisting of North Carolina, South Carolina, Mississippi, Arkansas, Tennessee and Texas, there is a significant

trend in boll weight from September 1 to the end of the season. A second group of States, consisting of Louisiana, Oklahoma, Alabama, and Georgia, indicates very little trend in boll weight from September 1 to the end of the season. This trend in boll weight was studied by observing the ratio of bolls already picked to the total bolls expected and relating this fraction to the ratio of September 1 boll weight to final average boll weight for the season. It appeared from this study, that where less than 10 percent of the bolls were picked, the weight per boll was not useful in the forecast as the historical average boll weight from previous years. Where 10 percent or more of the bolls were picked and the final average boll weight was estimated from the weight of the bolls already open in determining the weight for group 1, it appeared that no further adjustment was required in the weight per boll. The smaller the fraction picked, the greater adjustment required in the observed weight per boll. In order to use the information on trend in cumulative average boll weight, it was necessary to apply a 3-day weighted drying ratio to the weight of seed cotton picked in the field. A comparison of the 3-day weighted drying ratio and a 10-day weighted drying ratio indicated that one percentage point or 0.01 should be deducted from the 3-day weighted drying ratio to derive an estimated 10-day drying ratio at the end of the 3-day period. Table 5.13 shows the adjustment factors for the dry weight per boll by sub-groups. The same table would also be used on October 1, if less than 50 percent of the bolls had been picked.

Table 5.13--Adjustment Factors by Sub-Groups to be Used in
Estimating Season Average Boll Weight

Ratio of bolls picked to date to total bolls expected	Group I N. C., S. C., Miss., Ark., Tenn., Texas	Group II La., Okla., Ala., Ga.
Percent		
10	0.860	1.00
20	.895	1.00
30	.930	1.00
40	.965	1.00
50	1.000	1.00

October 1 Forecast:

The October 1 forecast is concerned primarily with the total number of bolls which have reached the large-boll category by that date. Small bolls and blooms are assumed not to contribute much to final yield except for a few which may mature in time to be picked. Those largely offset large bolls knocked from

the plants after October 1. An accurate count of the total bolls set by
October 1 can be obtained if the open bolls picked and the burrs found on the
previous months are snapped and disposed of outside of the sample plot area.
These burrs and open bolls are added to the large bolls and burrs still present
at the time of the October 1 survey. This method of obtaining the October 1
total large boll count is fairly important in arriving at an accurate count in
those States where a large portion of the cotton opens prior to October 1.

The weight per boll may be estimated accurately in most States by means of
the method discussed previously in connection with the September 1 forecast.
The bolls picked and weighed in the September 1 survey are added to those picked
at the time of October 1 survey. The 3-day moisture loss of seed cotton for the
October 1 cotton samples must be used to estimate the drying ratio while the
final drying ratio for the September 1 picking will now be available.

A harvesting loss of about 5 percent has been deducted to obtain the net
yield for the October 1 forecast. The 5 percent is the equivalent weight of
seed cotton corresponding to the open and large bolls found in the post-harvest
survey.

Analysis of Data for Western States:

Objective yield surveys were conducted in Arizona, California and New
Mexico for the first time in 1957. The schedule of surveys was the same as
in the other cotton States except that a fourth visit was made about November 1
to a subsample of fields. Only large bolls were counted on November 1. The
data from these surveys were expected to provide a basis for developing pre-
liminary forecasting procedures and for testing the extent to which relationships
found in the rainfall Cotton Belt might apply to irrigated cotton. A summary
of the counts per 40 feet of row by months is given in Table 5.13.

Table 5.13--Fruit Observations per 40 Feet of Row

Kind of fruit	States											
	Arizona				California				New Mexico			
	Aug.1	Sept.1	Oct. 1	Nov.1	Aug.1	Sept.1	Oct.1	Nov.1	Aug.1	Sept.1	Oct.1	Nov.1
L.B.	194	475	612	820	148	361	487	552	74	408	548	520
S.B.	133	101	59		168	111	37		129	214	69	
B.	48	33	25		62	38	11		58	71	16	
Sq.	570	265	230		921	314	93		1052	716	105	
Total fruit	945	874	926		1299	824	585		1313	1409	738	
Total bolls	375	609	696	820	378	510	535	552	261	693	633	520
& bolls opened to date	1.1	13.1	35.4	65.4	0	3.3	38.0	66.9	0	0.3	18.6	79.0
Wet wt. of seed cotton per boll	6.6	6.6	7.0	6.9	-	6.3	7.9	7.5	-	7.2	6.6	6.6

The August 1 procedures used in the rainfall Cotton Belt do not appear suitable because of the more advanced stage of maturity of the plants in irrigated areas by that date. Practically all fields have some large bolls by August 1, but the total fruit load on the plants has not yet reached a maximum. The average rate of increase in the boll count per day is likely to depend in part on the stage of development of the plants. However, the maturity categories doubtlessly need to be different from those used in the rainfall belt. The large boll category may need to be sub-divided into those already open and large bolls not yet open. The categories being considered are shown below:

Maturity categories	Age of bolls	
	Total bolls	Large bolls
	Days	Days
(1) Only squares present	-10	-31
(2) Small bolls or blooms present but no large bolls	10	-10
(3) Large bolls present less than number of plants	28	7
(4) Large bolls present greater than number of plants	42	21
(5) Open bolls less than number of plants	56	35
(6) Open bolls greater than number of plants	63	42
No additional bolls maturing	140	120

The average increase in bolls per day appears to be relatively constant through September 1. About this time the bolls begin to open rather rapidly and new bolls are added at a much slower rate. The average rates are shown in Table 5.14 and by Chart 5.1. In New Mexico the number of new bolls added after October 1 is offset by the dropping of bolls formed previously. The large bolls accumulated at a much faster rate in New Mexico and California where the large bolls are about 7 and 11 days later than in Arizona. The accumulation in Arizona is nearly constant through the season.

Table 5.14--Increase in Total and Large Bolls per Day per 40 Feet

Fruiting period	Arizona				California				New Mexico			
	Total bolls		Large bolls		Total bolls		Large bolls		Total bolls		Large bolls	
	Age	Rate	Age	Rate	Age	Rate	Age	Rate	Age	Rate	Age	Rate
	Days	Bolls	Days	Bolls	Days	Bolls	Days	Bolls	Days	Bolls	Days	Bolls
To Aug. 1	40.9	9.2	19.9	9.6	32.9	11.2	12.0	11.2	29.1	7.1	8.1	8.1
To Sept. 1	71.9	8.5	50.9	9.3	63.9	7.9	43.0	8.2	60.1	11.4	39.1	10.2
To Oct. 1	101.9	6.8	80.9	7.5	93.9	5.6	73.0	6.6	90.1	7.0	69.1	7.8
To harvest	-	6.2	-	7.3	-	4.4	-	5.2	-	4.3	-	5.1

Chart 5.1--Accumulation of Large Bolls by Age of Bolls

The large bolls formed by November 1 and the season average boll weights were used to calculate a gross yield per acre. The gross yield per acre indicated is 1,434 pounds of lint for Arizona, 1,013 pounds for California, and 932 pounds for New Mexico. The gleanings shown in Table 5.16 represent approximately 9.8 percent of the calculated gross yield in Arizona, 13.1 percent of the gross yield in California and 5.9 percent of the gross yield in New Mexico. The net yields resulting after substracting these gleanings are 1,294 pounds in Arizona, 880 pounds in California and 877 pounds in New Mexico. The yields reported by the growers are given in Table 5.15. For the sample fields, the yields reported were 1,051 pounds in Arizona, 912 pounds in California, and 782 pounds in New Mexico.

Table 5.15--Post-harvest Interview Data for Sample Fields

State	Reported acres standing Aug. 1 : Acres	Percent of acres harvested : Percent	Yield of lint per acre : Pounds	Lint per bale : Pounds	Estimate of seed cotton left per acre : Pounds	Methods of harvest						
						Fields in sample : No.	Fields with 2 or more methods : No.	Hand: Picked : No.	Hand: Snapped : No.	Machine: Picked : No.	Machine: Snapped or later picked by hand : No.	Gleaned by hand : No.
Ariz.	1517.0	100.0	1,051	503.5	74	28	16	20	3	21	0	9
Calif.	1910.5	99.8	912	498.6	38	50	11	21	3	37	0	2
N. Mex.	1469.2	99.9	782	498.9	23	25	6	25	1	4	1	1

Table 5.16--Post-harvest Gleanings for Sample Fields per 40 Feet of Row

State	Fields gleaned : No.	Open bolls : No.	Large unopened bolls : No.	Other: bolls dried up or rotten : No.	Seed cotton			
					In open bolls : Grams	Found loose : Grams	Total field weight : Grams	Total dry weight : Grams
Ariz.	29	87.3	39.7	11.1	305.4	230.7	536.1	520.0
Calif.	28	29.7	26.8	15.5	158.9	335.6	494.5	479.7
N. Mex.	19	33.5	0.0	67.6	148.1	53.8	201.9	197.2
Western States	76	52.6	25.0	26.8	212.0	225.0	437.0	423.9

6. 1957 Objective Corn Yield Surveys

6.1 Procedures and Sample Design

Samples of 720 corn fields in the 12 Southern States and 680 in the 11 North Central States were selected from the June Interview Survey. In the South the more important States were assigned 70 fields each and the others 50 per State. In the North Central States fields were allocated to States in proportion to the acreage of corn planted. In all States sample fields were selected with probabilities proportional to acres of corn planted for all purposes as reported in the June Survey. This procedure was the same as in 1956. The number of fields selected for observation in each State is shown in Table 6.1, together with the number on which observations were actually made as of August 1, September 1, October 1 and after harvest. In the North Central States, only one-fourth of all fields selected were visited as of August 1.

Table 6.1--Number of Corn Fields by States

	Southern States						North Central States				
State	Fields selected	Fields sampled				State	Fields selected	Fields sampled			
		8/1	9/1	10/1	Pt.-Harv. Glean.			8/1	9/1	10/1	Pt.-Harv. Glean.
	No.	No.	No.	No.	No.		No.	No.	No.	No.	No.
Ala.	70	65	63	61	39	Ill.	113	25	100	102	41
Ark.	50	40	39	38	30	Ind.	57	14	54	52	4
Ga.	70	63	54	52	27	Iowa	138	31	127	123	9
Ky.	70	61	62	57	23	Kans.	17	4	16	15	7
La.	50	42	41	37	11	Mich.	23	5	20	18	12
Miss.	50	47	44	44	9	Minn.	75	25	73	70	17
N. C.	70	66	63	63	45	Mo.	75	16	67	62	34
Okla.	50	41	30	21	2	Nebr.	52	11	50	49	43
S. C.	50	50	49	69	34	Ohio	46	10	43	41	31
Tenn.	70	64	64	62	36	S. D.	48	12	45	42	29
Tex.	70	59	32	29	44	Wisc.	36	9	31	26	13
Va.	50	48	43	34	12						
Region Totals	720	646	584	567	312	Region Totals	680	162	626	600	240

Growers on farms where the sample fields were located were interviewed at the time of the first visit to obtain their cooperation and to obtain pertinent data on acreage and expected yields. Two sample plots were located in each field to be used for plant observations and counts. On later visits, samplers proceeded directly to the sample plots to make observations without contacting the grower. After farmers harvested their fields they were interviewed for data on acres harvested and final yields. Post-harvest gleanings were also made in as many sample fields as possible.

Whenever mature corn was found in a sample field, the ears in the sample plots were hravested and weighed and sample ears taken from the field for laboratory determination of shelling percentage, moisture content and size characteristics. In the South, these determinations were made by agencies within each State in the program. In the North Central States, sample ears from all fields were sent to a central laboratory at Iowa State College on September 1, October 1, and November 1 (if the corn was still unharvested). The work in the North Central States was concerned with forecasts and estimates of corn quality, as well as with forecasts and estimates of yield. Plant observations and laboratory tests on sample ears in the North Central States were more extensive than in the South because of this aspect of the work. The results from the yield studies are described in the next four sections of this chapter. The results from the quality studies in the North Central States are described in the last section.

6.2 August 1 Survey

The operator was interviewed to obtain data on corn acreage, utilization, and expected yields for the sample fields. The acreage data was used in conjunction with the planted acreages of corn reported in the June Survey to obtain the acreage for grain and the yield per acre for grain. The results for the two regions are summarized in Table 6.2.

Table 6.2--August 1 Farm Interview Data for Sample Fields

Item	Southern States	North Central States
	Thous.	Thous.
Acres planted - Reported in June	15,873	53,630
Acres planted - Reported in August	15,412	52,723
Net acres planted to corn - Gross acres planted less ditches, fence rows and other unplanted areas in fields	15,330	51,927
Net acres standing on August 1	14,920	51,456
Net acres to be harvested for grain	13,709	49,083
Expected yield per acres for grain	32.5	61.1
Expected production (bushels)	(Million) 446	(Million) 3,000

In each sample field, two plots were selected. Each plot consisted of two double 15-foot row sections which were located by means of random row and pace numbers. The following information was recorded for each sample plot:

(1) Distance across 4 row spaces.

(2) Plant and fruit counts in the entire plot.

    a. Number of stalks

    b. Number of stalks with ears or silked ear

    c. Number of ears or silked ear shoots

    d. (If no ears or silked ear shoots are present):
       Number of stalks with tassels visible

(3) Observations on the first 5 ears on plants beyond
     row 1 in plot 2.

    a. Observed stage of maturity of each ear

    b. (If 3 of 5 in milk stage or later) average length
       of kernel rows

(4) Observations on entire 15-foot row section in row 1
     of plot 2.

    a. Length of cob for each ear in the row section
       measured over husk

(5) (If corn mature) Counts for each 15-foot row section.

    a. Number of ears husked with grain

    b. Weight of ears with grain

The results of these observations are summarized in Table 6.3 for each of
the Southern States and for the North Central Region.

Table 6.3--Average August 1 Counts in Two Sample Plots

State	Average row spacing Ft.	Stalks per 60 ft. No.	Stalks with ears per 60 ft. No.	Ears with kernels formed per 60 feet No.	Maturity classification of 5 ears with kernels — Percent in category					Fields in milk stage or later					
					Mature Pct.	Dent Pct.	Dough Pct.	Milk Pct.	Pre-milk or earlier Pct.	Lgth. of cobs in 15 ft. In.	Ears meas-ured in 15 ft. No.	Avg. lgth. of cob In.	Avg. lgth. of kern. row In.	No. of fields No.	Total fields No.
Ala.	3.418	27.1	24.1	34.1	0	15.0	13.1	28.8	43.1	69.6	10.4	6.72	5.98	36	65
Ark.	3.215	39.8	26.4	34.3	4.0	17.5	13.0	7.5	58.0	124.8	15.1	8.32	6.89	18	40
Ga.	3.412	23.2	20.5	32.9	11.4	47.6	16.5	5.1	19.4	56.7	9.6	5.89	5.17	55	63
Ky.	3.347	33.8	17.9	25.0	0	0	1.6	10.2	88.2	116.7	14.5	8.05	6.47	6	61
La.	4.102	38.0	29.0	31.9	2.9	21.9	23.8	15.7	35.7	73.3	10.8	6.79	7.06	28	42
Miss.	3.477	31.1	24.1	32.8	0.4	26.0	17.0	12.8	43.8	75.7	12.1	6.24	5.82	25	47
N. C.	3.579	35.0	28.3	47.9	2.1	17.9	13.0	26.7	40.3	93.6	15.8	5.91	4.70	45	66
Okla.	3.362	25.6	14.1	16.2	1.5	5.9	5.9	10.7	76.0	68.0	9.6	7.08	5.95	10	41
S. C.	3.931	32.2	25.2	36.9	0	19.6	22.0	21.2	37.2	62.5	9.8	6.37	7.32	33	50
Tenn.	3.348	31.0	14.4	20.7	0	4.4	1.3	5.6	88.7	76.1	10.7	7.13	6.93	6	64
Tex.	3.386	25.2	22.3	32.9	27.8	42.1	13.9	4.7	11.5	51.9	9.1	5.73	5.06	54	59
Va.	3.479	38.2	22.2	28.4	0	2.1	3.3	21.3	73.3	77.6	9.9	7.84	6.98	11	48
Southern Region	3.463	30.2	22.3	32.5	5.4	22.3	12.2	14.0	46.1	76.3	11.4	6.54	5.83	327	646
N. Cent. Region	3.318	48.0	12.4	16.2	0	0	0	2.5	97.5	84.4	14.2	6.18	5.94	5	162

The data collected were converted into yield forecasts for each of the Southern States and the North Central Region. Forecasts of the individual components 1/ and the yield per acre are shown in Table 6.4.

Table 6.4--August 1 Forecast of Yield Components and Net Yield per Acre

State or Region	Fraction of stalks with ears	Ratio of ears presented to ears expected to produce grain	Ears counted per 60 ft.	Ears with grain expected per 60 ft.			Wt. of grain per ear 1956-57 average	Conversion factor to net yield per acre	Net yield per acre
				Based on ears present	Based on stalk counts	Aver-age			
			No.	No.	No.	No.	Lbs.		Bu.
Ala.	0.889	1.257	34.1	27.1	27.1	27.1	0.263	3.414	24.3
Ark.	.663	.934	34.3	36.7	39.8	38.3	.278	3.646	38.8
Ga.	.884	1.244	32.9	26.5	23.2	24.8	.288	3.420	24.4
Ky.	.531	.745	25.0	33.5	33.8	33.6	.388	3.486	45.4
La.	.762	1.080	31.9	29.5	38.0	33.8	.282	2.844	27.1
Miss.	.775	1.110	32.8	29.6	31.1	30.3	.272	3.356	27.7
N. C.	.808	1.153	47.9	41.5	35.0	38.3	.326	3.260	40.7
Okla.	.551	.775	16.2	20.9	25.6	23.2	.212	3.471	17.1
S. C.	.782	1.110	36.9	33.2	32.2	32.7	.270	2.923	25.8
Tenn.	.464	.648	20.7	32.0	31.1	31.5	.317	3.485	34.8
Tex.	.888	1.257	32.9	26.2	25.2	25.7	.283	3.386	24.6
Va.	.581	.820	28.4	34.6	38.2	36.4	.381	3.354	46.5
Southern States	0.738	1.047	32.5	31.0	30.2	30.6	0.301	3.370	31.0
N. Cent. States	0.258	0.379	16.2	42.8	48.0	45.4	0.410	3.517	65.5

1/ A general discussion of the methods of forecasting individual yield components is to be found in the April 1958 issue of Agricultural Economics Research and the specific tables used in the 1958 Supervisors Manual on objective yields.

By August 1 only about one-half of the corn acreage in the Southern States and practically none in the North Central States has developed sufficiently to permit the length of cob or kernel rows measurements to be used to estimate final weight of grain per ear. To date, it appears that the historical average weight of grain per ear is the most useful tool for estimating yield on August 1. In addition, practically nowhere in the North Central Region has the crop developed sufficiently (milk stage or later) by August 1 to permit the use of an ear count to predict the number of ears that will produce grain.

6.3 September 1 Survey

In the Southern States the same sample plots were visited again for observations similar to those made on August 1. In the North Central States where only 25 percent of the total sample was contacted in August, the remaining 75 percent was visited for the first time on September 1. For the latter, operators were interviewed to obtain pertinent data on acreage and expected yield, as for farms visited for the first time on August 1. The results of the interviews are summarized in Table 6.5.

Two sample plots were located in each field for plant observations. Plots already laid out on August 1 were revisited. Two sample ears from each pair of plots in the North Central States were "harvested" and sent to the laboratory at Iowa State College for analysis. These ears formed the basis for the corn quality work and also provided a basis for forecasting the final weight of grain per ear from weight and length measurements.

Table 6.5--September 1 Farm Interview Data for Sample Fields

Items	North Central States
	Thous.
Acres planted - Reported in June	53,630
Acres planted - Reported on September 1	50,627
Net acres planted to corn - Gross acres planted less ditches, fence rows, and other unplanted acres in fields	50,208
Net acres standing on September 1	49,351
Net acres to be harvested for grain	45,981
Expected yield per acre for grain	59.1
Expected production (bushels)	(Million) 2,717

The average counts for the Southern States are given in Table 6.6 and for the North Central States in Table 6.7.

Table 6.6--September 1 Average Counts for 2 Sample Plots - Southern States

| State | Stalks per 60 ft. | Ears with Kernels formed per 60 ft. | Maturity classification of 5 ears with kernels — Percent in category | | | | | Fields in milk stage or later | | | | | Total fields |
| | | | Mature | Dent | Dough | Milk | Pre-milk | Length of cobs in 15 ft. | Ears measured in 15 ft. | Average length of cob | Average length of ker-nel rows | No. of fields | |
	No.	No.	Pct.	Pct.	Pct.	Pct.	Pct.	In.	No.	In.	In.	No.	No.
Ala.	26.8	26.9	32.1	58.7	5.1	3.5	0.6	40.9	6.6	6.18	5.21	63	63
Ark.	40.2	33.2	43.1	24.1	10.8	11.3	10.7	76.9	8.7	8.79	6.83	35	39
Ga.	22.7	29.4	66.6	30.0	1.5	0	1.9	43.8	7.6	5.75	5.40	53	54
Ky.	33.5	26.5	3.5	38.4	18.4	11.6	28.1	72.5	8.0	9.07	6.27	44	62
La.	36.9	32.1	35.1	52.2	4.9	3.4	4.4	56.5	8.9	6.37	6.03	39	41
Miss.	30.0	31.1	47.7	39.5	5.0	7.3	0.5	49.6	7.9	6.18	5.45	44	44
N. C.	33.7	35.8	55.3	23.5	13.3	6.0	1.9	60.6	8.9	6.82	5.20	63	63
Okla.	25.0	17.9	32.0	20.7	12.0	15.3	20.0	37.6	5.8	6.50	5.77	24	30
S. C.	27.8	29.3	31.6	62.3	4.7	1.4	0	46.4	7.3	6.35	5.82	44	49
Tenn.	29.0	24.8	9.7	43.1	13.1	11.3	22.8	56.3	7.7	7.32	5.74	51	64
Tex.	24.0	27.9	71.8	16.3	2.5	6.9	2.5	64.7	7.2	6.47	5.48	32	32
Va.	36.3	30.5	19.5	35.0	17.2	19.5	8.8	51.7	8.1	6.39	5.88	40	43
Region	29.1	29.2	41.3	37.1	8.0	6.6	7.0	54.1	7.7	6.72	5.62	532	584

Table 6.7--September 1 Average Counts for 2 Sample Plots - North Central States

State	Average row spacing:60 ft. Ft.	Stalks per 60 ft. No.	Ears with kernels formed per 60 ft. No.	Maturity classification of 5 ears with kernels — Percent in category					Fields in milk stage or later					Total fields No.
				Mature Pct.	Dent Pct.	Dough Pct.	Milk Pct.	Pre-milk Pct.	Length: of cob in 15 ft. In.	Ears measur-ed in 15 ft. In.	Avg. length of cob In.	Avg. length of ker. rows In.	No. of fields No.	
Ill.	3.314	53.4	46.8	0	13.6	29.0	40.4	17.0	112.6	12.2	9.24	7.76	83	100
Ind.	3.338	49.0	42.9	0	1.8	1.9	73.7	22.6	106.0	11.9	8.91	8.29	42	54
Iowa	3.317	53.2	53.9	0	4.0	21.1	68.8	6.1	127.1	13.7	9.27	7.44	122	126
Kan.	3.328	31.9	30.3	8.8	41.2	18.8	28.7	2.5	106.4	10.1	8.49	5.97	16	16
Mich.	3.298	49.0	39.5	0	0	3.0	55.0	42.0	87.9	10.1	8.34	7.13	13	20
Minn.	3.303	55.4	53.2	0	.3	11.8	80.8	7.1	109.4	13.2	8.27	7.43	68	73
Mo.	3.359	47.9	43.3	15.4	22.2	9.5	40.6	12.3	93.7	11.2	8.35	7.71	58	67
Nebr.	3.384	35.0	39.5	0	2.8	22.0	62.0	13.2	93.3	10.0	9.36	6.97	48	50
Ohio	3.348	50.2	41.2	0	5.6	4.6	73.5	16.3	76.9	11.1	6.94	6.46	37	43
S. D.	3.398	41.6	47.1	0	1.3	10.2	58.7	29.8	97.9	10.6	9.21	7.09	35	45
Wisc.	3.327	66.8	58.3	0	2.6	11.6	35.5	50.3	173.1	18.9	9.14	8.19	15	31
Region	3.335	50.0	47.2	1.9	7.6	15.6	58.8	16.1	109.4	12.3	8.84	7.48	537	626

The cob length measurements were used to derive an expected weight of grain per ear at harvest, based on previous years' data. The pertinent factors used in computing yield per acre are given in Tables 6.8 and 6.9.

Table 6.8--September 1 Forecast of Yield Components and
Net Yield per Acre - Southern States

State	Ears with grain expected per 60 feet	Wt. of grain expected per ear @ 15.5% moisture			Weight of grain per 60 ft.	Conversion factor to net yield per acre	Net yield per acre
		Based on length of cob	Based on lgth. of kern. row	Weighted average			
	No.	Lbs.	Lbs.	Lbs.	Lbs.		Bu.
Ala.	26.9	0.224	0.249	0.235	6.32	3.414	21.6
Ark.	33.2	.447	.393	.423	14.04	3.646	51.2
Ga.	29.4	.187	.266	.219	6.44	3.420	22.0
Ky.	30.0	.471	.343	.416	12.50	3.486	43.6
La.	32.1	.240	.322	.271	8.70	2.844	24.7
Miss.	31.1	.224	.270	.242	7.53	3.356	25.3
N. C.	35.8	.278	.248	.267	9.56	3.260	31.2
Okla.	21.4	.251	.299	.275	5.88	3.471	20.4
S. C.	28.6	.238	.321	.272	7.78	2.923	22.7
Tenn.	26.9	.321	.296	.310	8.34	3.485	29.1
Tex.	27.9	.249	.273	.259	7.23	3.386	24.5
Va.	30.5	.242	.308	.268	8.17	3.354	27.4
Region	29.7	0.271	0.286	0.277	8.23	3.370	27.9

Table 6.9--September 1 Forecast of Yield Components and
Net Yield per Acre - North Central States

State	Ears with grain expected per 60 ft.	Wt. of grain expected per ear at 15.5% moisture			Weight of grain per 60 ft.	Conversion factor to net yield per acre	Net yield per acre
		Based on length of cob	Based on lgth. of ker- nel row	Weighted average			
	No.	Lbs.	Lbs.	Lbs.	Lbs.		Bu.
Ill.	46.8	0.485	0.455	0.476	22.28	3.520	78.4
Ind.	42.9	.436	.450	.440	18.88	3.495	66.0
Iowa	53.9	.486	.446	.475	25.60	3.518	90.1
Kan.	30.3	.421	.316	.379	11.48	3.506	40.2
Mich.	39.5	.389	.392	.390	15.40	3.538	54.5
Minn.	53.2	.401	.446	.413	21.97	3.533	77.6
Mo.	45.6	.404	.459	.421	19.20	3.474	66.7
Nebr.	39.5	.495	.405	.465	18.37	3.448	63.3
Ohio	41.2	.288	.298	.291	11.99	3.486	41.8
S. D.	47.1	.438	.401	.427	20.11	3.343	67.2
Wisc.	58.3	.453	.420	.445	25.94	3.507	91.0
Region	47.5	0.441	0.426	0.436	20.82	3.540	73.7

In addition to estimating the weight of grain per ear from length measure-
ments, laboratory observations on the two ears from each sample field sent to
Iowa State College made it possible to obtain another indication of weight per
ear. The ear characteristics are given in Table 6.10. The approach which has
been under study involves relating the stage of maturity of the ears and kernels
to the fraction of final dry weight laid down to date. The moisture content
of the kernels is the most useful "maturity index" found to date for estimating
the fraction of final kernel weight already laid down. The nature of the
relationship between the percent of dry matter in the kernels and fraction of
dry matter laid down is shown below:

Dry Kernel Weight/Wet Kernel Weight	Fraction of Dry Matter Laid Down
Percent	Percent
0	0
10	10
20	20
30	33
40	53
50	74
60	90
70	97
80	100

It is likely, as more data become available, that certain portions of the curve will need to be modified. Additional factors to supplement this relationship may also be found.

Table 6.10--Average September 1 Ear Characteristics and Forecast Weight per Ear Based on Laboratory Sample Ears, North Central States

State	Circum-ference of ear at middle	Average length		Wet weight of ear	Weight of kernels		Average moisture content of kernels	Fraction of dry matter laid down	Expected weight of kernels at harvest at 15.5% moisture	
		Of cob	Of kernel rows		Wet	Dry				
	In.	In.	In.	Grams	Grams	Grams	Percent		Grams	Lbs.
Ill.	6.29	9.24	7.88	330	214	80.7	64.7	.460	205	0.452
Ind.	5.52	8.76	7.63	253	146	45.8	74.3	.302	178	.392
Iowa	6.22	9.36	8.08	330	214	80.8	64.1	.463	204	.450
Kan.	5.80	8.09	6.92	228	147	73.7	52.6	.710	121	.267
Mich.	5.33	7.84	7.00	198	107	27.6	82.4	.175	184	.406
Minn.	6.12	8.73	7.60	291	179	55.5	70.5	.340	191	.421
Mo.	5.92	8.66	7.52	267	171	80.5	59.2	.610	154	.340
Nebr.	5.96	8.86	7.33	281	169	59.4	69.1	.395	176	.388
Ohio	5.59	8.12	7.02	224	125	38.1	74.3	.300	149	.329
S. D.	5.30	8.40	6.99	221	121	36.0	74.8	.293	144	.317
Wisc.	5.51	7.87	7.23	230	123	40.2	74.7	.315	149	.329
Region	5.92	8.79	7.57	280	173	62.6	68.1	.417	176	0.387

6.4--October 1 Survey

In the Southern States the sample plots were harvested after the counts and other measurements had been made. Of the ears harvested, only those with at least one or more kernels were counted and weighed. In a few cases the corn was relatively immature and the plots were not harvested. In the North Central States sample plots were harvested only in those fields where the crop was well dented or mature. For those plots which were not harvested by October 1, a fourth visit was made during late October to harvest the corn from the sample plots. Two sample ears from each pair of plots were sent to a central location in each of the Southern States and to the Laboratory at Iowa State College for the North Central States. The average counts for the Southern States are given in Table 6.11 and for the North Central States in Table 6.12. Laboratory data for the North Central States are shown in Table 6.13.

In Table 6.11, the count of picked ears with kernels sometimes exceeds the count of ears with kernels on the plants. The counts on the plants were sometimes too low because immature ears were classified without pulling back the husk and some such ears with kernels could not be identified until they were picked later.

Table 6.11--October 1 Average Counts for 2 Sample Plots and
Net Yield per Acre - Southern States

State	Ears with kernels formed	Ears picked with one or more ker.1/		Shelling percent	Moisture content	Net yield
		Picked	Field weight			
	No.	No.	Lbs.	Pct.	Pct.	Bu.
Ala.	26.6	26.3	9.56	79.2	19.2	24.7
Ark.	34.2	31.3	18.57	75.0	24.7	43.8
Ga.	29.4	30.9	10.75	82.8	15.8	30.3
Ky.	32.8	32.8	18.65	74.6	25.1	43.3
La.	31.0	31.7	10.54	81.5	21.9	22.6
Miss.	29.7	29.7	11.61	81.4	20.7	29.8
N. C.	34.8	34.5	14.58	75.2	24.1	32.1
Okla.	16.4	14.7	10.44	76.6	21.1	25.9
S. C.	25.0	29.1	11.18	83.6	18.4	26.4
Tenn.	26.6	28.2	13.68	76.2	24.8	32.3
Tex.	27.7	25.6	8.65	79.9	13.4	24.4
Va.	27.7	27.7	12.30	71.1	26.0	25.7
Region	29.2	29.5	12.32	78.2	21.2	30.4

1/ For those fields in which the plots were not harvested, the ear count and
length measurements were used as estimates of ears picked and weight of ears.

Table 6.12--October 1 Average Counts for 2 Sample Plots and
Net Yield per Acre - North Central States

State	Ears with ker. formed per 60 ft.	Measurements per 15 ft.		Average length		Weight of grain per ear 1/			Weight of grain per 60 ft.1/	Net yield per acre 2/
		Length of cob	Ears	Cobs	Ker. rows	Based on length of		Com-bined aveg.		
						Cobs	Ker. rows			
	No.	In.	No.	In.	In.	Lbs.	Lbs.	Lbs.	Lbs.	Bu.
Ill.	49.1	110.3	12.3	8.67	7.77	0.458	0.477	0.463	22.73	80.0
Ind.	48.1	95.6	11.8	8.13	7.83	.410	.482	.431	20.73	72.5
Iowa	52.0	114.8	13.2	8.73	7.48	.463	.451	.460	23.92	84.2
Kan.	29.0	54.9	7.1	7.79	5.27	.380	.254	.329	9.54	33.4
Mich.	47.0	76.0	10.3	7.36	7.02	.342	.410	.362	17.00	60.2
Minn.	54.6	103.9	13.7	7.60	6.77	.363	.387	.369	20.15	71.2
Mo.	45.7	84.7	10.3	8.18	7.27	.415	.432	.420	19.20	66.7
Nebr.	34.2	81.8	8.9	9.20	7.29	.505	.434	.479	16.38	56.5
Ohio	47.3	79.2	11.6	6.82	5.99	.294	.318	.301	14.24	49.6
S. D.	43.5	85.1	10.4	8.16	6.71	.413	.382	.403	17.53	58.6
Wisc.	62.9	123.7	15.5	8.00	7.92	.399	.490	.421	26.48	92.9
Region	48.2	98.4	11.9	8.23	7.27	0.421	0.429	0.422	20.34	71.2

1/ At 15.5% moisture content.
2/ Conversion factors from pounds of grain per 60 ft. to bushels per acre are
the same as used on September 1 and given in Table 6.9.

Table 6.13--Average October 1 Ear Characteristics and Forecast
Weight per Ear Based on Laboratory Sample Ears -
North Central States

State	:Circum-: :ference: :of ear : : at : :middle :	Average length Of cob	: : Of :kernel: : rows :	Wet :weight: : of : : ears :	: Weight of : kernels : Wet :	: : : Dry :	:Average : :moisture: : content: : of : :kernels :	:Fraction: : of dry : : matter : : laid : : down	:Expect. wt. :of kern. @ :harv. at :15.5% mois- :ture conten
	: In.	: In. :	In.	:Grams	: Grams	: Grams:	Pct.	:	:Gram; Lbs.
Ill.	: 6.56	: 8.87:	7.85	: 359	: 269	: 138	: 39.2	: 0.850	: 190:0.419
Ind.	: 6.34	: 8.62:	7.53	: 336	: 247	: 144	: 43.6	: .867	: 195: .430
Iowa	: 6.51	: 9.06:	7.75	: 350	: 263	: 160	: 39.3	: .912	: 205: .452
Kan.	: 5.57	: 7.25:	5.66	: 187	: 141	: 100	: 28.8	: .975	: 120: .265
Mich.	: 6.06	: 7.95:	6.65	: 275	: 199	: 109	: 47.9	: .810	: 158: .348
Minn.	: 6.25	: 8.27:	7.05	: 303	: 224	: 126	: 44.0	: .850	: 173: .381
Mo.	: 6.18	: 8.21:	6.94	: 271	: 196	: 128	: 36.8	: .940	: 159: .351
Nebr.	: 6.31	: 8.85:	7.32	: 328	: 238	: 138	: 43.0	: .870	: 185: .408
Ohio	: 5.95	: 7.65:	6.28	: 250	: 181	: 104	: 43.3	: .862	: 142: .313
S. D.	: 6.20	: 8.38:	6.90	: 291	: 210	: 111	: 46.5	: .800	: 162: .357
Wisc.	: 6.50	: 8.68:	7.51	: 345	: 256	: 145	: 45.5	: .840	: 202: .445
Region	: 6.33	: 8.56:	7.30	: 318	: 235	: 135	: 41.4	: 0.888	:179.4:0.396

6.5 November 1 Survey

This survey was made only in the North Central States and was included in
the project because it was believed that a number of fields would not be suffi-
ciently mature to harvest before that date. However, it was found that most
of the fields would probably be harvested before that date and only 121 pre-
harvest observations could be made. Pre-harvest weights and ear counts are
shown in Table 6.14 for the November 1 survey date and for all plots harvested
for the season. Laboratory data for mature ears are shown in Table 6.15.
Preharvest yield data are given in Table 6.16.

Table 6.14--1957 Data for Two Sample Plots Harvested, North Central States

State	Plots harvested November 1					All plots harvested during season							
	Fields	Ears with gr. per 60 ft. of row	Field wt. of ear corn per 60 ft. of row	Shell-ing percent	Mois-ture content	Fields	Ears with gr. per 60 ft. of row	Field wt. of ear corn per 60 ft. of row	Shell-ing percent	Mois-ture content	Field wt. per ear	Wt. of grain per ear at 15.5% moisture When picked	At maturity
	No.	No.	Lbs.	Pct.	Pct.	No.	No.	Lbs.	Pct.	Pct.	Lbs.	Lbs.	Lbs.
Ill.	13	36.0	23.1	76.4	30.4	97	51.4	38.6	76.0	36.2	0.752	0.431	0.458
Ind.	11	50.2	30.6	74.6	36.5	52	47.4	32.9	74.7	39.3	.694	.372	.404
Iowa	30	45.0	33.5	77.1	31.3	122	51.7	39.4	75.7	36.1	.761	.436	.465
Kan.	0	-	-	-	-	15	28.9	12.9	74.4	28.6	.446	.281	.288
Mich.	4	37.5	15.1	68.4	37.3	18	42.4	25.8	71.0	42.8	.609	.293	.340
Minn.	17	55.6	28.8	75.4	34.4	67	54.8	33.8	74.4	41.0	.617	.320	.361
Mo.	11	41.7	21.9	67.5	26.4	59	45.8	26.4	73.4	30.1	.578	.351	.363
Nebr.	4	22.0	15.5	73.9	33.2	48	36.6	25.4	70.9	40.7	.695	.346	.388
Ohio	16	47.3	21.8	74.4	31.8	41	47.4	25.5	74.1	35.4	.538	.304	.321
S. D.	0	-	-	-	-	38	43.4	24.7	72.3	45.6	.569	.265	.322
Wisc.	15	63.0	37.8	74.6	30.6	24	62.3	40.7	75.0	34.4	.654	.381	.398
Region	121	47.2	28.2	74.6	31.9	581	48.5	32.6	74.3	37.3	0.672	0.372	0.402

Table 6.15--Average Characteristics for Mature Ears, Based
on Laboratory Samples, North Central States

State	Average length		Wet weight of ears	Weight of kernels			
	Of cob	Of kernel rows		Wet	Dry	At 15.5% moisture content	
	In.	In.	Grams	Grams	Grams	Grams	Lbs.
Ill.	8.9	7.9	350.3	268.9	176.2	206.0	0.454
Ind.	8.6	7.9	353.8	269.9	171.0	200.0	.441
Iowa	8.9	7.8	326.7	251.4	166.8	195.0	.430
Kan.	7.5	6.0	196.8	148.7	108.6	127.0	.280
Mich.	8.4	7.6	304.0	229.0	139.2	162.7	.359
Minn.	8.2	7.3	276.8	211.1	137.3	160.6	.354
Mo.	8.4	7.3	275.5	209.0	147.9	172.9	.381
Nebr.	9.0	7.8	335.5	255.9	167.2	195.5	.431
Ohio	7.3	6.2	219.1	165.4	113.4	132.6	.292
S. D.	7.9	6.2	196.8	149.8	103.9	121.5	.268
Wisc.	8.2	7.4	272.3	202.8	142.9	167.1	.368
Region	8.5	7.5	306.5	233.9	155.8	182.2	0.402

Table 6.16--Pre-harvest Yield Characteristics for All
Sample Plots Harvested, North Central States

State	Ears with grain per 60 ft.	Weight of grain at maturity at 15.5% moisture		Net yield per acre, using	
		Per ear	Per 60 ft.	10 percent harvesting loss	Observed harv. loss (gleanings)
	No.	Lbs.	Lbs.	Bu.	Bu.
Ill.	51.4	0.458	23.54	82.9	86.4
Ind.	47.4	.404	19.15	66.9	68.3
Iowa	51.7	.465	24.04	84.6	90.0
Kansas	28.9	.288	8.32	29.2	25.1
Mich.	42.4	.340	14.42	51.0	52.7
Minn.	54.8	.361	19.78	69.9	71.6
Mo.	45.8	.363	16.63	57.8	57.0
Nebr.	36.6	.388	14.20	49.0	47.7
Ohio	47.4	.321	15.22	53.1	53.9
S. D.	43.4	.322	13.97	46.7	46.4
Wisc.	62.3	.398	24.80	87.0	95.0
Region	48.5	.402	19.50	68.6	70.5

6.6 Post-harvest Survey

Farmers were interviewed after they had harvested the sample fields. The information for the Southern States is given in Table 6.17 and for the North Central States in Table 6.18. The tables provide information on acres standing August 1 (or September 1 in the Corn Belt States), yield per acre harvested for grain, and method of harvesting. Also the grower's estimate of the amount of corn left in the field in the harvesting operation and the numbers of fields grazed by livestock after harvest are also included. The post-harvest gleaning data are given in Table 6.19 and 6.20.

Table 6.17--Post-harvest Interview Data for Sample Fields - Southern States

State	June acres harvested for grain	Yield per acre harv. for gr.	Method of harvesting				Growers esti. of bu. left per acre	Grazed by livestock		
			Hand pulled	Hand picked	Picked from shock	Ma-chine picked		Since harv. Yes	In harv. No	future "yes"
	Pct.	Bu.	No.	No.	No.	No.	Bu.	No.	No.	No.
Ala.	91.4	23.8	36	2	0	10	0.9	9	25	7
Ark.	99.4	51.0	10	4	1	23	3.2	6	26	4
Ga.	89.7	29.6	15	3	0	24	2.1	18	20	8
Ky.	90.7	47.2	22	5	6	21	2.0	14	25	3
La.	81.8	20.8	27	2	1	5	0.8	16	14	6
Miss.	99.2	31.2	29	0	0	7	1.8	12	13	9
N. C.	99.2	32.2	33	4	2	15	1.4	3	42	9
Okla.	98.8	14.1	6	2	0	0	0.4	5	3	1
S. C.	95.6	27.2	26	4	6	5	0.7	8	30	5
Tenn.	96.4	33.9	33	0	0	13	0.7	6	29	5
Tex.	97.5	27.5	28	7	0	24	1.1	13	38	11
Va.	92.9	24.8	6	8	1	9	1.2	0	18	5
Region	94.2	31.2	271	41	17	156	1.5	110	283	73

Table 6.18--Post-harvest Interview Data for Sample Fields -
North Central States

State	June acres harvested for grain	Yield per acre harv. for gr.	Method of harvesting				Growers esti. of bu. left per acre	Grazed by livestock		
			Hand pulled	Hand picked	Picked from shock	Machine picked		Since harv. Yes	No	In future "Yes"
	Pct.	Bu.	No.	No.	No.	No.	Bu.	No.	No.	No.
Ill.	95.7	76.1	0	0	0	86	4.4	24	53	20
Ind.	99.0	68.9	0	2	0	41	4.5	25	16	4
Iowa1/	94.8	63.8	0	0	0	36	4.1	24	11	10
Kan.	92.3	30.0	2	0	0	11	3.0	4	6	2
Mich.	104.3	57.5	1	1	0	13	3.9	3	10	4
Minn.	94.4	60.5	0	0	0	35	3.1	3	13	5
Mo.	97.7	57.6	2	2	1	43	2.4	11	25	8
Nebr.	99.1	53.3	0	1	0	45	3.3	11	22	12
Ohio	99.0	57.4	0	1	0	40	3.1	9	27	5
S. D.	97.0	39.6	0	1	0	33	1.8	15	18	10
Wisc.	97.5	77.5	0	1	1	16	1.9	8	10	5
Region	96.7	61.8	5	9	2	399	3.5	137	211	84

1/ Interview obtained on only 1/3 of the fields.

Table 6.19--Post-harvest Gleaning Data for Sample Fields,
per 60 Feet of Row and Middle - Southern States

State	Ears gleaned		Weight of kernels 1/			Moisture content of grain found	Gleanings per acre 1/
	From plants	From ground	From ears	Loose	Total		
	No.	No.	Grams	Grams	Grams	Pct.	Bu.
Ala.	1.4	0.7	112.4	7.4	119.8	19.3	1.0
Ark.	1.7	2.3	254.1	62.0	316.1	17.2	2.5
Ga.	2.0	2.0	230.4	21.2	251.6	10.8	2.1
Ky.	1.9	2.4	252.4	183.5	435.9	24.7	3.9
La.	.2	.3	2/	2/	2/	2/	2/
Miss.	2.4	3.8	340.6	37.4	378.0	18.2	2.8
N. C.	4.0	3.3	261.9	71.8	333.7	18.3	2.4
Okla.	0	1.5	0	77.2	77.2	13.0	1.2
S. C.	1.4	.8	124.0	2.3	126.3	15.4	1.3
Tenn.	1.4	.8	131.0	26.3	157.3	21.9	1.6
Tex.	.9	2.1	162.0	25.7	187.7	12.3	1.8
Va.	3.8	1.9	231.8	147.8	379.6	22.5	2.8
Region	1.9	1.9	204.0	50.4	254.4	17.3	2.1

1/ At 15.5% moisture content.

2/ Amount of corn gleaned too small for laboratory analysis.

Table 6.20--Corn: Post-harvest Gleaning Data for Sample Fields,
per 60 Feet of Row and Middle - North Central States

State	Fields	Ears gleaned		Dry weight of kernels			Moisture content of grain found	Gleanings per acre 1/
		From plants	From ground	From ears	Loose	Total		
	No.	No.	No.	Grams	Grams	Grams	Pct.	Bu.
Ill.	41	1.5	1.4	323.9	233.7	557.6	21.6	5.69
Ind.	4	2.8	1.5	415.2	176.5	591.7	24.2	6.04
Iowa	9	0.4	2.3	312.0	76.2	388.2	21.8	3.97
Kan.	7	0.9	5.4	554.7	163.7	718.4	19.1	7.32
Mich.	12	2.1	3.7	241.9	146.3	388.2	17.3	3.96
Minn.	17	2.8	1.7	286.3	308.4	594.7	24.9	6.07
Mo.	34	2.4	3.5	553.4	150.1	703.5	20.4	7.18
Nebr.	43	1.7	3.6	526.0	128.6	654.6	23.1	6.68
Ohio	31	2.4	3.2	285.1	209.9	495.0	26.1	5.05
S. D.	29	1.4	5.7	350.1	170.3	520.4	20.1	5.31
Wisc.	13	1.5	1.2	73.7	86.4	160.1	17.5	1.63
Region	240	2/1.7	2/2.6	2/357.8	2/168.7	2/526.5	22.0	5.74

1/ At 15.5% moisture content.

2/ Weighted by acres for harvest as grain.

6.7 Report on 1957 Corn Quality Study

As part of the Division's expanded research program, a pilot project was started in 1956 to develop procedures for early-season forecasts of potential frost damage prior to harvest and for measuring quality of mature grain. The 1957 project was a continuation of the 1956 study. A probability sample of 626 corn fields in the 11 North Central States was selected from the June acreage survey for the September 1, October 1 and November 1 visits. A one-fourth sub-sample of fields was selected for the August 1 visit. The fields were allocated to the 11 North Central States in proportion to corn acreages as indicated below:

State	Date of visit	
	August 1	Sept. 1 & Oct. 1
	No. of fields	No. of fields
Ill.	25	100
Ind.	14	54
Iowa	31	127
Kan.	4	16
Mich.	5	20
Minn.	25	73
Mo.	16	67
Nebr.	11	50
Ohio	10	43
S. D.	12	45
Wisc.	9	31
Total	162	626

The 1957 corn quality studies had as objectives the two main points examined in 1956, namely (1) observing the trend in the proportion of fields (acreage) which would reach maturity by specific dates as forecast from the silking rate prior to August 1, and as forecast again from the stage of development and moisture content on September 1, and (2) observing quality characteristics of the grain by taking samples of ears on each monthly visit, starting September 1, and subjecting the grain to laboratory study. Two ears from each sample field were sent to the laboratory at Iowa State College each month starting September 1. The moisture content was measured for all corn, regardless of stage of development. Kernels showing discoloration or effects of weevil, earworm, or disease damage were separated from sound kernels.

In 1956 the crop was sufficiently advanced as of August 1 and September 1 that prospects of potential frost damage were nil except for a small fraction of the acreage in the most northern parts of the Corn Belt. Characteristics of the grain observed indicated little damage to the crop prior to harvest. The grain expected to be cribbed or stored appeared to be of excellent quality and was not expected to deteriorate during storage. In 1957 development of the crop was delayed by wet weather at planting time. As a result, the possibility of frost damage or soft corn was of much concern to the Department and the industry.

August 1 Survey. In practically all States, plant and ear development was late. Chart 6.1 shows the fraction of the acreage expected to reach maturity (maximum dry matter in kernels) by specific dates as forecast from the August 1 observations. The chart indicates that on August 1, 1957 the crop was considerably behind 1956 for the Corn Belt as a whole. Only about 4 percent of the acreage was estimated to be safe from a killing frost by September 1, 28 percent by October 1, and the entire acreage by the latter part of October. Late September and early October is the critical time when killing frosts are likely. The second curve on Chart 6.2 (at the point x = 0) indicates that about 62 percent of the acreage was expected to "mature" prior to the first killing frost. In terms of the amount by which yield would be reduced, for acreage not reaching maturity by the normal date of first killing frost, a potential yield loss of 7-10 percent was indicated for the northern tier of States. Elsewhere, little or no reduction in yield from frost was expected.

From a practical point of view, one would conclude on August 1 that, if the 1957 season was normal after that date, the average yield would not be affected much by frost except in the more northernly portions of the Corn Belt. However, the crop was expected to be later than 1956 and unharvested corn would have a higher moisture content on October 1 and November 1. The chart indicates that an additional half of the acreage would be adversely effected by a killing frost occurring one week earlier than normal over the entire region. Obviously, an early frost would affect a large part of the acreage and would be expected to reduce yields significantly.

September 1 Survey. By September 1, potential yield losses from frost were lower for the Belt as a whole than indicated on August 1. This is shown by Charts 6.1 and 6.2. The late planted corn developed so rapidly during August that it was expected to reach maximum dry matter content (maturity) only a few days behind the 1956 crop. The yield was not expected to be reduced by a killing frost on or near the normal date of occurrence, but the unharvested crop as a whole was expected to carry a higher moisture content as of October 1. This suggested that harvesting would be later than in 1956.

Ear samples taken on September 1 indicated little grain damage. However, Table 6.21 shows ears in all stages of development to have greater moisture content than in 1956. In general, there was little evidence on September 1 of possible serious damage to the crop unless frosts occurred earlier than normal. However, an earlier than normal frost would reduce the yield potential, especially in the northern tier of States.

Chart 6.1.--Fraction of acreage expected to mature
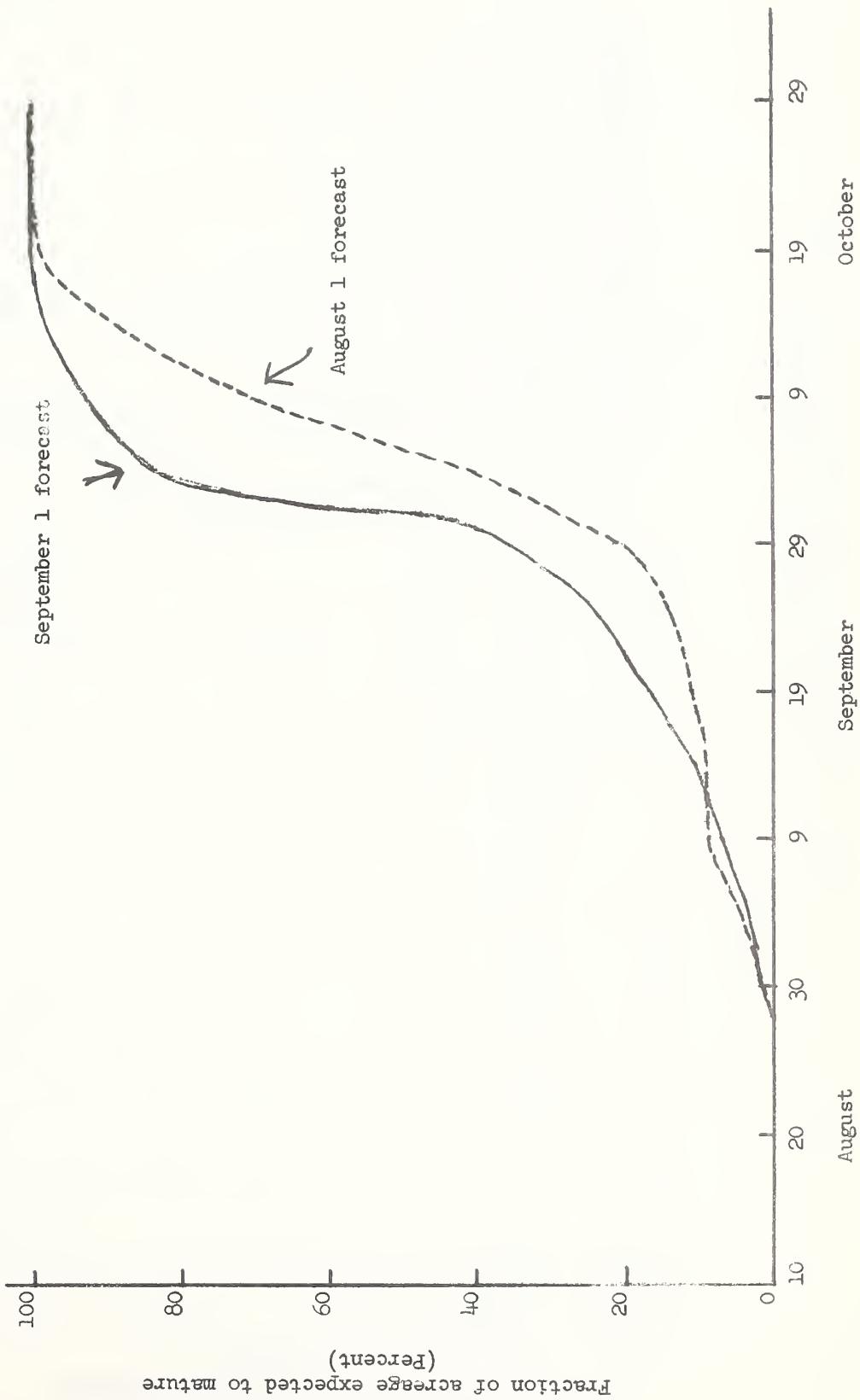by specified dates (N. C. States, 1957)

Chart 6.2-Fraction of acreage expected to mature before
killing frost (N. C. States, 1957)

Days in relation to frost date

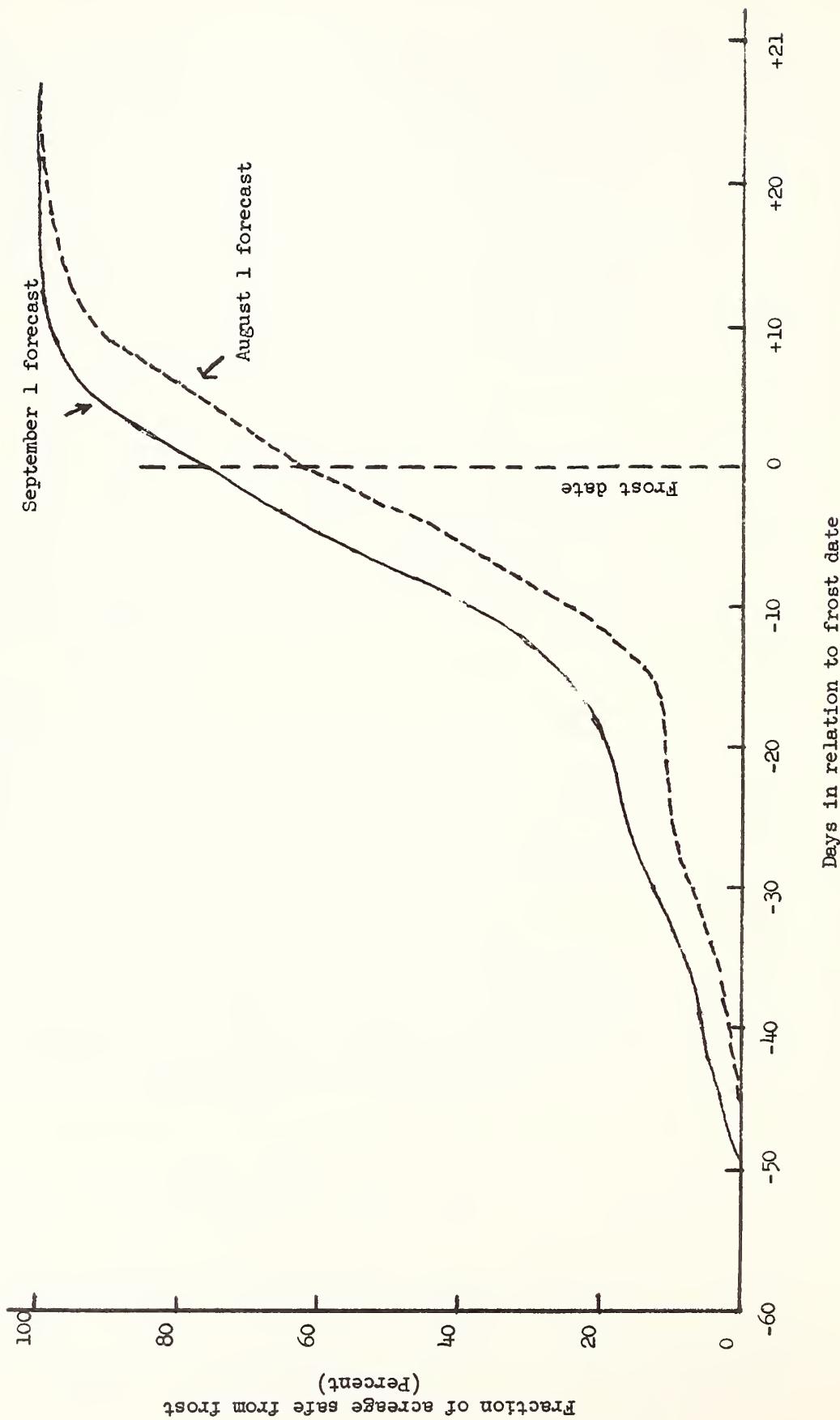Fraction of acreage safe from frost
(Percent)

Table 6.21--Percent of Ears Showing Damage, Percent of Kernels Damaged and Moisture Content of Sample Ears in Various Stages of Development--September 1, 1957 Stage of Development - North Central States

State	Mature			Dent			Dough			Milk		
	Percent ears with damage	Percent kernels damaged	Moisture content	Percent of ears	Percent of kernels	Moisture content	Percent of ears	Percent of kernels	Moisture content	Percent of ears	Percent of kernels	Moisture content
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Ill.	100	3.9	42.3	21	1.2	52.1	7	0.2	63.1	13	0.7	69.2
Ind.	-	-	-	17	0.4	45.9	-	-	-	12	1.0	71.5
Iowa	-	-	-	50	2.6	49.8	15	1.2	57.2	17	1.7	65.5
Kan.	50	10.3	30.9	42	1.2	45.4	75	4.6	54.3	62	4.3	72.7
Mich.	-	-	-	-	-	-	50	1.5	54.2	6	0.9	74.5
Minn.	-	-	-	-	-	-	0	0	58.9	13	0.5	71.0
Mo.	5	0.1	34.2	30	4.6	47.7	23	0.9	55.3	11	1.1	77.5
Nebr.	-	-	-	50	7.0	47.9	12	0.4	58.6	23	1.0	71.2
Ohio	-	-	-	50	1.3	48.0	33	0.3	58.5	2	0.5	75.0
S. D.	-	-	-	-	-	-	17	0.9	60.4	7	2.6	71.5
Wisc.	-	-	-	-	-	-	0	0	51.8	5	1.8	74.2
1957 Region	19	2.0	34.3	30	2.4	49.2	15	0.8	58.7	14	1.0	70.5
Number of Fields	13			49			99			366		
1956 Region	3	1/0.2	27.9	2	1/0.3	44.9	1	1/	56.3	.3 1/	0	72.1
Number of Fields	36			152			200			175		

1/ Percent damaged kernel weight of total weight of kernels.

October 1 Survey. By October 1 approximately 85 percent of the crop was safe from frost as compared to 95 percent in 1956. In general, the crop carried a higher moisture content than a year earlier, and harvesting was behind 1956. While some immature fields in the northern portion of the Belt were caught by killing frosts during September, the reductions in yield were generally small.

The extent of damage or discoloration to kernels and ears is shown in Table 6.22. While some damage was present, the quality of the crop was good on October 1.

Table 6.22--Percent of Ears Showing Damage, Percent of Kernels Damaged and Moisture Content of Sample Ears in Various Stages of Development--October 1, 1957 - North Central States

State	Mature			Dent			Dough			Milk		
	Percent ears	Percent kernels content	Moisture content	Percent ears	Percent kernels content	Moisture content	Percent ears	Percent kernels content	Moisture content	Percent ears	Percent kernels content	Moisture content
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Ill.	16	0.5	34.9	20	1.0	42.7	37	2.2	53.2	0	0	72.5
Ind.	16	0.4	36.5	6	0.2	41.6	0	0	55.6	0	0	69.4
Iowa	20	1.0	34.9	33	1.8	40.0	37	2.4	53.9	50	2.7	65.6
Kan.	32	2.9	25.4	33	1.9	41.3	-	-	-	-	-	-
Mich.	13	0.5	39.6	0	0	46.3	0	0	53.7	0	0	74.7
Minn.	32	1.1	37.5	26	1.4	44.5	0	0	53.5	-	-	-
Mo.	21	0.8	26.3	46	2.2	43.0	33	1.1	50.2	33	2.9	68.9
Nebr.	23	1.2	35.2	42	2.5	43.0	37	1.4	54.6	0	0	62.6
Ohio	0	0	30.4	4	0.1	40.0	0	0	52.7	0	0	67.5
S. D.	0	0	30.8	26	1.4	45.2	11	1.3	56.3	0	0	64.2
Wisc.	-	-	-	20	0.4	41.9	25	7.2	54.3	0	0	72.5
1957 Region	19	0.8	33.4	24	1.3	42.4	17	1.2	54.1	13	1.0	69.1
Number of Fields	205			295			51			26		
1956 Region	0.3	1/ 0	26.6	0.7	1/ 0	38.4		1/ 0	54.7		1/ 0	67.0
Number of Fields	398			142			9			4		

1/ Percent damaged kernel weight of total weight of kernels.

7. 1957 Soybean Objective Yield Studies

7.1 Introduction

Objective soybean yield studies were continued in 1957 on about the same level as in 1956. Surveys were conducted again in the North Central States starting August 1 with operator interviews and field observations on one-half of the selected fields. For September 1, operators of the remaining fields were interviewed and objective counts made on all sample fields. October 1 plant observations were made on the sample plots in fields not yet harvested. On fields already harvested, post-harvest observations were taken, along with an interview of the operator.

In addition to the above, detailed fruiting studies were continued by the Illinois office. Data from this study parallel very closely the growth curve developed from the 1956 data, thus indicating a reliable model.

7.2 August 1 Survey

Objective field observations were made on 75 of the 173 fields selected. Observations were recorded from two randomly selected plots, each consisting of two row sections 3 feet long, in each designated field. The recorded observations were: width across 4 row spaces, number of plants, number of plants with blooms or pods, and the number of fruiting positions on row 1 of each unit. In addition, detailed observations were made on the first plant beyond the unit on each row, consisting of fruiting positions on main stems, lateral branches with blooms or pods, blooms, pods, and pods with beans. These individual plant observations were used to classify fields into one of the four maturity categories as shown in Table 7.1.

Table 7.1--Classification of Sample Fields by State and
Maturity Class, August 1

State	Maturity class				Total by States
	Pods not set	More blooms than pods	More pods than blooms	Some pods with beans	
	No. of fields	No. of fields	No. of fields	No. of fields	No. of fields
Ill.	4	2	12	0	18
Ind.	3	0	1	5	9
Iowa	1	1	6	2	10
Kan.	2	1	0	0	3
Mich.	0	1	1	1	3
Minn.	1	3	3	3	10
Mo.	2	0	1	0	3
Nebr.	0	1	2	0	3
Ohio	2	3	3	1	9
S. D.	0	1	2	0	3
Wisc.	2	2	0	0	4
Region total:	17	15	31	12	75
Region Pct. :	22.7	20.0	41.3	16.0	100.0

The average pod load by maturity class as developed in 1956 model is given in column 3 of Table 7.2, together with the average percent of full pod load for the average plant in the region.

Table 7.2--Computation of Average Percent of Full Pod
Load, August 1

Maturity class	Relative number: of fields	Percent of full pod load
	Pct.	Pct.
No pods set	23	0
More blooms than pods	20	15
More pods than blooms	41	75
Some pods with beans	·16	100
Weighted average	100	50

The above computations show that on August 1 the pod set was 50 percent of the expected total set. With 724 pods per two row section present on August 1 a total set of 1,448 pods was forecast.

The growth curve developed from the detailed Illinois data shows that of the total pods set about 87 percent are present on September 1 and only about 71 percent still remain on October 1. These percentages applied to the August 1 forecast of the total pods to be set provided a forecast of 1,260 pods to be present on September 1 and 1,028 pods on October 1.

Using the average weight per pod of threshed beans from 1956 (.2779 grams) and the October 1 pod forecast, a gross yield of 27.3 bushels per acre was derived. Allowing about the same harvesting loss as in 1956 (7 percent), a net yield of 25.4 bushels per acre was forecast as of August 1.

7.3 September 1 Surveys

Field observations were again made on the same sample plots as on August 1. In addition, operator interviews and field observations were made on the remainder of the sample.

By September 1 most of the pods have formed; thus the question is how many will produce beans. Results of the 1956 observations show the ratio of pods with beans to total pods on September 1 approximates the ratio of October 1 pods

to September 1 pods. That is, the number of pods with beans present on September 1 indicates the total number of pods to be found a month later. The above observations applied to 1957 are computed as follows:

$$\frac{\text{September 1 count of pods with beans}}{\text{September 1 count of all pods}} = 0.735$$

September 1 pods with beans per unit (1,460) x 0.735 = 1,073

The above computation of 1,073 pods to be present on October 1, incidentally, is only one pod different from the average number of pods picked on October 1. The expansion of pods per position gives 1,460 on September 1 and, as shown by the growth curve, 82 percent of the pods present on September 1, or 1,197 pods, will be present on October 1.

From the above pod counts, per acre yield forecasts using the 1957 average bean weight per pod of 0.2779 gram are computed as follows:

For 1,197 total pod estimate - forecast = 29.4 bushels

For 1,073 total pod estimate - forecast = 26.4 bushels

Allowing harvesting loss of 2.7 bushels the net yields were 26.7 and 23.7 or an average of 25.2 bushels per acre.

7.4 Grower Interviews - August and September

Grower interviews conducted on one-half of the sample on August 1 showed acreage standing for beans at 84 percent of that reported in June and the remaining half of the sample showed 86 percent on September 1. An overall average of 85 percent of the acres planted or intended to be planted on June 1 was standing for beans as of September 1. Yield estimates from these interviews averaged 23.0 bushels per acre.

7.5 October 1 Surveys

Observations made the last week of September were similar to those of August 1 and September 1. After the counts of plants with pods and positions with pods were made, all pods were picked from row 2 of each double-row section, placed in bags, and mailed to the Illinois office for laboratory analysis.

Expansion of the field observations showed an average of 1,205 pods present per 6 feet of row, while the actual count of pods picked averaged only 1,073 pods per 6 feet of row. This is about 11 percent less and is just the opposite of the 1956 results. To determine the effect, if any, of a few immature sample fields from which pods were not picked from the row sections, tabulations of field counts were made on samples identical with those from which pods were picked. A summary of these tabulations are presented in Tables 7.3 and 7.4.

Using the 1,205 pods per 6 feet of row, 3.016 feet of row width and the 1957 weight per pod of .293 grams a gross yield forecast of 31.2 bushels was derived. Allowing a harvesting loss of 2.7 bushels this gives a net yield of 28.5 bushels. Expanding the average threshed weight of beans picked per 6 feet of row from the laboratory data gives a gross yield of 27.8 bushels per acre; deducting the expected harvesting loss gives a net of 25.1 bushels per acre.

Table 7.3--Plants, Positions, and Pods Counted as of October 1, 1957

State	Counts for 6 feet of row		Individual plant counts		
	Plants with pods	Positions with pods	Positions	Pods	Pods per position
	No.	No.	No.	No.	No.
Ill.	48.70	529.22	11.66	29.86	2.561
Ind.	44.61	494.66	10.97	27.36	2.494
Iowa	58.46	604.30	11.11	30.21	2.719
Kan.	39.00	478.00	10.25	24.38	2.378
Mich.	44.50	378.24	10.12	24.75	2.446
Minn.	64.25	529.12	10.08	22.47	2.229
Mo.	48.90	425.20	11.55	27.60	2.390
Nebr.	51.75	640.50	9.88	31.00	3.138
Ohio	38.73	379.00	8.84	17.84	2.018
S. D.	61.25	572.50	9.75	20.75	2.128
Wisc.	45.83	356.00	8.26	15.66	1.896
Region	50.75	498.84	10.54	25.49	2.418

Table 7.4--Number and Weight of Beans Picked from Row Sections
and Sent to Laboratory

State	No. sample fields	Averages per 6 feet of row				
		Pods	Pods with beans	Wt. of pods with beans	Weight of threshed beans	Average weight beans per pod
	No.	No.	No.	Grams	Grams	Grams
Ill.	30	1,280	1,199	553.6	394.3	0.329
Ind.	9	1,118	1,063	482.2	351.7	.331
Iowa	13	1,199	1,136	483.5	324.2	.285
Kan.	2	1,272	1,226	421.0	291.4	.238
Mich.	4	810	775	393.8	292.2	.377
Minn.	16	1,081	1,034	432.6	288.8	.279
Mo.	5	1,057	1,007	422.4	296.3	.294
Nebr.	2	1,352	1,140	489.9	332.0	.291
Ohio	13	673	652	319.9	228.0	.350
S. D.	4	1,078	1,020	384.5	265.3	.294
Wisc.	6	546	522	237.1	153.3	.281
Region	104	1,072	1,014	449.84	314.15	0.310

As shown in Table 7.4, about 94.5 percent of the pods counted contained
beans. This appears to be a little high. It is quite possible that the
laboratory was unable to find or identify all the small immature pods in the
bag. A field count of pods picked would provide some check on the laboratory
count.

A more detailed analysis was made by the laboratory on a sub-sample of
20 pods with beans from each sample. A summary of the results of this analysis
is given in Table 7.5.

Table 7.5--Weight and Number of Beans and Pods from Sub-
sample of 20 pods with Beans from Laboratory Samples

State	Average weight of unthreshed pod	Average number of beans per pod	Average weight of threshed beans per pod	Average weight per bean
	Grams	No.	Grams	Grams
Ill.	0.457	2.134	0.322	0.151
Ind.	.437	2.100	.314	.150
Iowa	.425	1.969	.298	.151
Kan.	.338	1.875	.232	.124
Mich.	.468	1.588	.345	.217
Minn.	.417	2.092	.298	.143
Mo.	.407	2.180	.281	.129
Nebr.	.425	1.950	.290	.149
Ohio	.477	2.185	.345	.158
S. D.	.396	1.950	.266	.136
Wisc.	.435	1.917	.295	.154
Region	0.439	2.065	0.309	0.149

7.6 Post-harvest Surveys

Again in 1957 the operators were interviewed after harvest to obtain the
final production or yield of the sample field, the acreage actually harvested
and an estimate of the harvesting loss.

Table 7.6--Yield per Acre, Harvesting Loss, and Abandonment
From Post-harvest Interview

State	Sample fields	Ratio of acres for harv. to acres standing Aug. 1 or Sept. 1	Reported yield per acre	Reported harv. loss per acre
	No.	Pct.	Bu.	Bu.
Ill.	48	99.5	25.5	1.5
Ind.	17	96.2	27.7	1.9
Iowa	23	100.0	28.6	1.9
Kan.	6	107.0	19.4	1.0
Mich.	6	100.0	28.4	3.0
Minn.	19	101.0	24.1	1.3
Mo.	14	99.0	22.5	3.0
Nebr.	6	100.0	25.3	3.0
Ohio	22	96.0	23.7	1.6
S. D.	6	100.0	18.5	2.5
Wisc.	6	89.0	7.1	1.2
Region	173	98.87	24.50	1.82

Field observations were made as soon after harvest as possible. Even then many fields were plowed or pastured before the enumerator could make the observations. A summary of these observations is given in Table 7.7.

Table 7.7--Pods and Beans Found in Field After Harvest

State	Observation for 12 feet of row					
	Plants	Unthreshed pods		Beans on ground		Weight
		On plants	On ground	Whole	Split	All beans threshed
	No.	No.	No.	No.	No.	Grams
Ill.	76.0	73.9	59.4	222.9	45.5	76.38
Ind.	103.2	67.0	28.5	161.5	9.0	65.16
Iowa	73.0	36.3	69.0	197.8	12.6	75.36
Kan.	69.7	54.3	15.7	153.3	2.0	44.24
Mich.	106.0	35.0	10.0	71.0	2.3	26.67
Minn.	119.9	55.1	44.0	212.7	10.0	46.92
Mo.	70.0	33.2	75.8	114.8	24.0	53.20
Nebr.	54.8	36.8	106.8	117.2	6.0	77.12
Ohio	89.9	54.1	20.5	92.2	3.6	32.02
S. D.	90.0	218.0	267.0	209.3	16.7	163.00
Wisc.	--	--	--	--	--	--
Region	85.24	61.60	57.89	173.51	20.32	61.28

Harvesting loss per acre, using the average threshed weight per sample for all beans, computes to 2.72 bushels per acre.

To determine the relationship between pods present September 1 and October 1 by maturity categories, a tabulation of identical samples was made. The results of this tabulation are shown in Table 7.8.

Table 7.8--Percent Change in Pods Present from Sept. 1
to Oct. 1 by Maturity Category for Identical Fields

September 1 Maturity Category	Change in pods present on 4 plants	Change in pods present per 6 feet of row
	Percent	Percent
I No pods formed	350	346
II More blooms than pods	150	217
III More pods than blooms	83	81
IV Blooms, pods and pods w/beans	75	78
V Pods and pods w/beans, no blooms	79	73
All categories	78.8	74.8

Studies are continuing for the refinement of the forecasting model.
However, special emphasis should be directed toward determining why the
difference of the October 1 field count and the count of the pods by the
laboratory. Part of the difference can be assumed to be the loss of identity
of immature pods sent to the laboratory. There are other factors which could
be affecting it such as over-counting of positions. As a check against the
laboratory count, all pods picked could be counted before shipment to the
laboratory. Further investigation should be made of the relationship between
the September 1 ratio of pods with beans to all pods and the ratio of pods
October 1 to September 1 total pods.

8.   1957 Objective Burley Tobacco Yield Surveys in Kentucky

8.1 Procedures and Sample Design

This study was conducted to get a good objective measure of Burley tobacco yields in Kentucky. There was some question within the Division as to the proper levels of acreage and yield even though accurate information on total production is always available at the end of the season. As it was believed that an accurate objective measure of yield per acre could be obtained with less effort than an objective check on harvested acreage, it was decided to obtain an objective yield estimate which would indicate where the acreage level needs to be to account for the known production.

A sample of 100 Burley fields was selected with probabilities proportional to size from among those enumerated in the June 1957 interview survey in Kentucky. In each of these fields two random 50-foot row sections were selected for plant observations. The observations consisted of distance between adjacent total plants standing in the measured row sections, and the number of plants in the measured row sections which appeared to be in such condition that they could reasonably be expected to be cut at harvest time. Observations were actually made in 98 of the fields selected, one field being inaccessible because of road conditions, and one being in the Soil Bank.

Later in the year, starting in late October, the farms on which the sample fields had been selected were visited again to get the average weight of cured tobacco per plant. In these surveys it was necessary to make some substitutions because tobacco was not always ready for stripping or for other reasons which made it impossible to obtain tobacco weights. On the first round of visits to the barns in late October no substitutions were made, except in cases where the tobacco was already stripped. On the second round of visits several weeks later, substitutions were made whenever arrangements could not be made to obtain weights on the selected farms. Samples of cured tobacco plants were weighed in each barn in six bunches or lots of five plants each. After weighing, the plants were stripped by the farmer and the stalks weighed again. The weight of the cured leaves stripped was obtained by subtraction for each individual lot.

The average weight of cured tobacco per plant was applied to the estimated number of plants harvested derived from the August 1 survey to compute a yield per acre. That figure did not represent the entire yield because farmers primed some leaves in the fields before the plants were cut and those were cured separately. In addition, farmers salvaged a good many ground leaves and these were cured with the primed leaves. The form used for recording tobacco weights made provision for data on primed leaves. The procedure followed was to ask the farmer for his estimate of the fraction of the acreage on which priming was practiced and for his estimate of the average number of leaves primed per plant. In making the yield computations it was assumed that the average weight per leaf of the primed leaves would be approximately the same as for the leaves stripped from the plants at the time of the weight survey. After the work got underway it was discovered that, in addition to primed leaves, ground leaves salvaged by farmers were encountered frequently. These were cured with the primed leaves

but no provision for such tobacco was made on the record form because that practice had not been anticipated. However, the field workers obtained farmers' estimates of the total amount of such tobacco in the barns together with the acreage from which those leaves were salvaged. As a matter of fact, it became evident that farmers would have preferred to report primed leaves in the same way and many of them actually did so. In many cases, the estimated weight of primed leaves and ground leaves was reported as a single figure. It was evident that in future surveys both primed leaves and ground leaves should be recorded by asking the farmer to estimate the weight of cured tobacco coming from such leaves and the acreage involved in the practice.

8.2 Yield Computations

Plant observations in the 98 fields indicated the average row spacing to be 3.15 feet. On the average 59.04 plants were counted per 100 feet of row. Of these, 1.10 plants per 100 feet of row were plants that were not expected to produce tobacco. These observations indicated that there were 8,164 plants per acre of which 8,012 were expected to be harvested. The tobacco weights in the barn indicated that 91.32 grams of cured leaves were obtained from the average plant. Assuming that primed leaves weigh the same as leaves stripped from the stalks at time of weighing, the average weight of cured tobacco per plant was increased by 2.90 grams. The average weight of leaves stripped from the plants at the time of weighing, applied to the estimated number of plants harvested per acre, gave a computed yield of 1,613 pounds per acre. The estimated weight of primed leaves increased this by 51 pounds per acre. The effect of the estimated weight of ground leaves salvaged increased the computed yield by another 30 pounds per acre. The total objective yield thus became 1,694 pounds per acre. Dividing the Board end-of-season production estimate by ASC measured acreage gave a derived yield of 1,671 pounds per acre. The object-ive yield indication thus agreed very well with the hypothesis that the acreage harvested was fairly close to ASC measured acreage. The official estimate of yield per acre was somewhat lower because official Board acreage estimates are at a higher level than ASC measured acreages.

8.3 Precision of the Objective Indication

The sampling error in the estimated number of plants per acre depends upon the variability in the number of plants counted per 50 feet of row and on the sampling error in the estimated distance between adjacent rows. The sampling error in the estimated weight of tobacco per plant depends upon the variation in average weight of tobacco per plant from farm to farm. Sampling error in the computed yield per acre is a combination of the sampling errors in these components of yield. Sampling error in the estimated number of plants per row section was 1.8 percent. The sampling error in average row spacing was 0.3 percent. The sampling error in the average weight of tobacco per plant was 1.9 percent. The sampling error in the computed yield per acre is the square root of the sum of the squares of those three sampling errors or 2.6 percent.

9. 1957 Objective Surveys for Forecasting Winter Wheat Yields

9.1 Introduction

Objective plant observations have been made in sample fields in the spring of 1955, 1956, and 1957. In 1955 and 1956 surveys were made only in the winter wheat producing areas of Texas and Oklahoma. In 1957 they were expanded to the winter wheat producing areas of Illinois, Indiana, Kansas, Michigan, Missouri, Nebraska, and Ohio. Fields in which the observations were made were selected by a random process, with probabilities proportional to size, from farms reporting in acreage surveys made the preceding December. Acreages of winter wheat planted were reported in those surveys. The sample fields were allocated to individual States in proportion to the estimated acreage seeded in each State as estimated from the December survey. The studies in Texas and Oklahoma in 1955 and 1956 were comparatively small pilot studies, but in 1957, 350 fields were selected for this work in the 9-State area. This report gives the data collected in 1957, although data collected in Texas and Oklahoma in earlier years were used in interpreting the results and in deriving some of the relationships.

Field observations were made in small sampling units in the selected fields at monthly intervals from May 1 to harvest. On the first visit the farm operator was interviewed to obtain reported data on his wheat acreages and his judgment forecasts of yield per acre. After harvest, the farmer was interviewed again to obtain data on harvested acreages and his estimated final yield per acre. Post-harvest gleanings were also made in the sample fields to estimate harvesting losses under farm harvesting conditions. Although a total of 350 fields were allocated to the 9 States, some large fields were selected more than once in the process of selection with probabilities proportional to size. Each time such a field was selected, when it was selected more than once, it was counted as a separate field.

Two sampling units, each consisting of three adjacent row sections approximately 26 inches long, were selected at random in each field and measured off with a U-shaped sampling frame. When a field was selected more than once, two sampling units were taken each time the field was selected. Pertinent plant observations were made in the sampling units each month. When the crop was ready for harvest, all heads in the sampling units were harvested and threshed to get an objective indication of yield per acre. In most fields, observations were made as of May 1, June 1, and July 1 before farmers harvested the fields. In a few States, a preharvest survey of ripe grain was not possible until August. The data collected in these various visits are described below.

9.2 May 1 Survey

The operators of the farms on which the 350 sample fields were located were interviewed to obtain the data in Table 9.1. Only 91.4 percent of the wheat acreage reported as planted the previous December was still standing as of May 1. In addition, only 87.8 percent of the wheat still in the fields on May 1 was reported as intended for harvest as grain. On the average, farmers estimated that the yield would be 23.0 bushels per acre.

Table 9.1--Farm Interview - May 1, 1957

State	Fields	Ratio of May 1 acres standing to Dec. 1 planted	Ratio of May 1 acres for grain to May 1 standing	Growers forecast of yield per acre harv.
	No.	Pct.	Pct.	Bu.
Ill.	19	93.9	99.8	32.5
Ind.	13	99.2	100.0	30.9
Kan.	67	85.1	90.1	18.6
Mich.	15	93.8	95.2	32.9
Mo.	38	100.5	96.6	33.7
Nebr.	27	92.6	76.9	24.1
Ohio	22	108.7	97.5	26.8
Okla.	91	78.3	94.3	18.2
Tex.	58	101.7	61.9	15.7
Region	350	91.4	87.8	23.0

Plant observations were made on only 269 fields because some of the fields that had been reported as being planted to wheat the previous December had been placed in the Soil Bank. In some cases, interviewers were unable to make arrangements to obtain the field observations because of inability to contact the farmer or because of the farmer's refusal to cooperate in the study. Ten fields in Oklahoma were inaccessible at that time because of floods. The pertinent data are shown in Table 9.2. This table shows that the average distance across 10 row spaces was 6.74 feet. The total number of wheat stalks counted per 13.1 feet of row (2 sampling units) was 485. In order to convert the counts to a per acre basis, it was convenient to adjust these counts to a standard distance of 0.6 feet between two rows and to adjust the stalk count in 13.1 feet of row accordingly. On that basis, the number of stalks in 13.1 feet of row becomes 430. An average of 46 heads was counted in two sampling units. The height of the average stalk [1] was 8.8 inches. Forty-two damaged stalks were observed per sampling unit. Of the 269 fields observed, 227 had not yet reached the "Boot" stage of maturity. Forty-two fields had reached the "Boot" or "Flower" stage.

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[1] This average is the average of the maximum heights of the stalks observed in individual plants in each sample field. It reflects the height of plants.

Table 9.2--Field Counts - May 1, 1957

State	Samples	Distance across 10 row paces	No.of stalks 1/ Counted	No. of stalks Adj. to 0.6 ft. row spaces	No. of heads 1/	No. of damaged stalks 1/	Max. height of stalks	Fields by maturity stage Earlier than boot	Boot or flower	Milk	Soft dough or later
	No.	Ft.	No.	No.	No.	No.	In.	No.	No.	No.	No.
Ill.	16	6.06	624	624	6	84	8.9	16	0	0	0
Ind.	13	5.75	718	749	0	0	5.2	13	0	0	0
Kan.	57	7.37	424	311	0	21	2.6	57	0	0	0
Mich.	14	6.02	564	564	0	0	2.7	14	0	0	0
Mo.	38	5.96	515	515	0	3	8.6	38	0	0	0
Nebr.	24	6.47	543	504	0	78	2.1	24	0	0	0
Ohio	22	5.97	492	492	0	45	3.1	22	0	0	0
Okla.	2/57	6.26	425	408	197	87	23.3	18	39	0	0
Tex.	28	9.56	406	238	36	27	6.8	25	3	0	0
Region	269	6.74	485	430	46	42	8.8	227	42	0	0

1/ Per 13.1 feet of row (2 sampling units).

2/ 10 fields inaccessible because of flood.

9.3 June 1 Survey

The same sampling units used in the May 1 survey were visited again as of June 1. Sample heads were also clipped from plants outside of the sampling units and mailed to a central laboratory for size measurements. Observations were made in 257 fields on this visit. The observations were similar to those made a month earlier and the results are shown in Table 9.3. The laboratory observations on the sample heads are shown in Table 9.5.

Table 9.3--Field Counts - June 1, 1957

State	Fields	No. stalks 1/ Counted	No. stalks Adj. to 0.6 ft. row space	No. heads 1/ Emerged	In boot	No. of damaged stalks 1/	Max. height of stalks	Earlier than boot	Boot or flower	Milk or soft dough	Hard dough or ripe
	No.	No.	No.	No.	No.	No.	In.	No.	No.	No.	No.
Ill.	16	394	394	320	10	120	35.0	0	4	12	0
Ind.	13	344	359	196	23	36	34.8	3	8	2	0
Kan.	50	394	331	160	52	168	20.2	17	25	8	0
Mich.	15	358	358	19	29	0	19.2	11	4	0	0
Mo.	38	319	319	267	48	114	33.0	3	20	15	0
Nebr.	20	452	420	135	100	45	19.8	6	13	1	0
Ohio	22	305	305	47	86	198	23.9	7	10	5	0
Okla.	56	393	376	340	3	12	36.0	0	17	39	0
Tex.	27	398	247	266	76	12	24.6	5	3	19	0
Region	257	375	334	218	44	87	27.9	52	104	101	0

1/ Per 13.1 feet of row (2 sampling units).

9.4 July 1 Survey

The sample fields were visited a third time as of July 1. For fields that were not yet mature, observations similar to those made in previous months were taken again. Samples of heads were clipped and mailed to a central laboratory for analysis. For fields that were ripe and ready to be harvested, all heads in the sampling units were cut and sent to the laboratory for threshing and analysis. Those data are shown in Table 9.6. Data obtained in the field are shown in Table 9.4. Laboratory data on the sample heads are given in Table 9.5.

Table 9.4--Field Counts - July 1, 1957

State	Fields	No. stalks 1/ Counted	No. stalks Adj. to 0.6 ft. row space	No. heads 1/ Emerged	No. heads In boot	No. of damaged stalks 1/	Max. height of stalks	Earlier than boot	Boot or flower	Milk or soft dough	Hard dough or ripe	Harv. by grower
	No.	No.	No.	No.	No.	No.	In.	No.	No.	No.	No.	No.
Ill.	9	293	293	289	1	75	36.3	0	0	1	8	7
Ind.	13	281	293	249	1	51	40.7	0	0	1	12	0
Kan.	45	354	288	308	1	165	32.7	0	1	27	17	0
Mich.	15	270	270	257	1	12	48.5	0	0	0	15	0
Mo.	35	358	358	342	0	234	40.2	0	0	0	28	7
Nebr.	16	462	428	415	0	33	42.3	0	0	10	6	0
Ohio	22	194	194	183	1	99	35.6	0	0	22	0	0
Okla.	60	352	337	283	0	96	36.1	0	0	0	37	23
Tex.	27	323	203	319	3	39	28.4	1	0	10	16	0
Region	242	329	293	297	1	108	36.4	1	1	71	139	37

1/ Per 13.1 feet of row (2 sampling units).

Table 9.5--Laboratory Analysis of Head Samples

State	All samples June 1			All samples July 1			Hard dough and ripe samples				
	Field samples	Gross weight per head	Length per head	Field samples	Gross weight per head	Length per head	Field samples	Gross weight per head	Length per head	Wt. of grain per head	Moist. content of grain
	No.	Gr.	Ft.	No.	Gr.	Ft.	No.	Gr.	Ft.	Gr.	Pct.
Ill.	15	0.329	0.209	9	0.588	0.188	8	0.587	0.187	0.419	15.6
Ind.	11	.239	.211	13	.850	.209	12	.865	.207	.624	16.7
Kan.	31	.281	.202	45	.679	.193	14	.576	.183	.392	15.6
Mich.	4	.197	.230	15	.263	.240	4	1.047	.232	.822	13.8
Mo.	35	.358	.217	28	.734	.208	28	.734	.208	.494	17.1
Nebr.	11	.231	.203	16	.617	.195	3	.778	.186	.559	13.9
Ohio	13	.199	.221	22	.726	.227	8	.830	.206	.643	13.5
Okla.1/	38	.541	.212	56	.557	.201	28	.538	.198	.310	11.8
Tex.	3	.453	.223	21	.756	.226	21	.777	.224	.475	12.4
Region	161	0.383	0.210	225	0.666	0.204	126	0.696	0.203	0.465	14.4

Table 9.6--Objective Preharvest Yield Estimates -
July 1, 1957

State	Preharvest head count		Weight of grain per head	Gross bushels per acre	Net bushels per acre
	Per 13.1 feet	Per acre harvested			
	No.	No.	Gr.	Bu.	Bu.
Ill.	335	1,843,000	0.415	25.6	23.4
Ind.	249	1,444,000	.608	29.3	26.4
Kan.	308	1,375,000	.387	17.8	15.4
Mich.	249	1,384,000	1/ .600	27.7	25.8
Mo.	312	1,746,000	.485	28.2	27.2
Nebr.	415	2,143,000	1/ .360	25.8	23.4
Ohio	201	1,123,000	1/ .580	21.8	19.0
Okla.	296	1,577,000	.320	16.9	12.4
Tex.	319	1,113,000	.486	18.1	16.8
Region	299	1,479,000	0.465	23.0	20.8

1/ Read from Chart 9.2, using all samples processed July 1.

9.5 Post-harvest Survey

After the farmer harvested the sample fields, post-harvest gleanings were made in two sampling units of each sample field a few days after the fields were harvested. All grain salvaged in the sampling units was sent to the central laboratory for analysis. The operator of the farm was also interviewed for data on his harvested acreages, his estimate of the net yield per acre, his estimate of harvesting losses, and information relating to the method by which he arrived at his judgment estimate of yield. The interview data are summarized in Table 9.7. Data relating to the sample grain gleaned in the field are summarized in Table 9.8.

Table 9.7--Post-harvest Interviews - 1957

State	Farms	Ratio of acres harv. to acres standing May 1	Ratio of acres harv. to acres for grain May 1	Net yield per harv. acres	Method of determining production					Estimated harv. loss per acre
					Capacity of combine bins	Truck loads	Weighed at eleva-tor	Capacity of storage bins	Other	
	No.	Pct.	Pct.	Bu.	Farms	Farms	Farms	Farms	Farms	Bu.
Ill.	16	100	100	23.5	7	3	5	1	0	1.05
Ind.	13	102	102	29.1	2	0	11	0	0	1.12
Kan.	35	62	70	24.0	0	0	27	10	2	3.01
Mich.	15	95	98	31.3	5	1	4	2	2	2.11
Mo.	33	85	85	22.3	1	0	16	0	14	1.91
Nebr.	15	57	82	28.9	0	1	10	3	1	1.75
Ohio	22	96	98	22.1	7	2	10	5	0	0.77
Okla.	65	93	101	12.6	0	0	40	1	24	4.51
Tex.	28	74	99	17.1	3	0	25	0	0	1.77
Region	242	81.3	90.4	20.7	25	7	148	22	43	2.55

Table 9.8--Post-harvest Gleaning of Fields (per 13.1 Ft. row)

State	Fields	Whole heads found	Loose kernels found	Total weight of: heads and kernels	Threshed weight of grain	Moisture content of grain	Harvested loss per acre
	No.	No.	No.	Gr.	Gr.	Pct.	Bu.
Ill.	15	21.1	137.7	14.4	10.8	12.6	2.23
Ind.	13	21.2	141.3	16.9	13.6	13.2	2.85
Kan.	29	27.4	166.5	20.9	14.6	13.4	2.43
Mich.	13	22.5	166.0	9.6	8.8	11.3	1.87
Mo.	32	10.9	40.8	6.5	4.7	11.2	1.02
Nebr.	16	34.4	165.2	20.1	14.4	12.3	2.39
Ohio	22	28.0	110.0	17.1	13.3	13.0	2.78
Okla.	49	51.6	64.6	26.1	15.0	11.0	3.01
Tex.	27	18.0	85.9	11.5	6.8	10.0	1.34
Region	216	28.7	105.3	17.0	11.4	11.8	2.23

9.6 Development of Forecasting Procedures

The data collected in these various surveys were examined to discover relationships that would be useful in developing procedures in forecasting yields as of each date when observations were made. Early-season relationships can logically be expected to be less reliable than those involving data obtained just prior to harvest. This is particularly true for the Great Plains States where the crop is frequently influenced by marked changes in growing conditions in different years. However, this difficulty is partly alleviated by the fact that the crop matures earlier in that region than in other parts of the area covered by these surveys. A yield forecast as of May 1 must be based largely on stalk counts and the stage of development already attained by the plants. Comparatively few heads have been formed by that date. The weight that will be attained by the average head when heads reach maturity must also be based upon averages for previous years until a relationship between head weight at maturity and the characteristics of the plant on May 1 can be developed. The number of stalks counted on May 1 decreases from month to month. The greater the time interval between May 1 and maturity, the greater is the decrease.

Studies in Texas and Oklahoma in 1955 and 1956 indicated that about 80 percent of the stalks counted on May 1 survived to produce heads when the average plant had just reached the "Boot" stage by May 1. Table 9.9 shows how many stalks tend to disappear between May 1 and June 1 and between May 1 and July 1 for plants in two stages of maturity. The table also shows the number of heads per stalk for plants in these stages of maturity.

Table 9.9--Survival of Stalks in Identical Fields,
by Stage of Maturity on May 1

State	May 1 to June 1		May 1 to July 1		Preharvest heads per stalk	
	Flag stage or earlier	Boot or flower	Flag stage or earlier	Boot or flower	Flag stage or earlier	Boot or flower
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Ill.	63.0	--	49.4	--	96.4	--
Ind.	47.8	--	39.1	--	88.7	--
Kan.	83.5	--	69.0	--	87.0	--
Mich.	64.9	--	48.5	--	95.0	--
Mo.	61.9	--	58.1	--	95.7	--
Nebr.	77.2	--	65.7	--	90.0	--
Ohio	62.0	--	39.4	--	94.3	--
Okla.	85.7	95.4	66.4	95.4	91.0	73.0
Tex.	98.0	96.2	82.3	96.2	99.0	89.1
Region	73.8	95.5	60.2	95.5	92.7	74.2

Table 9.9 shows that in Texas and Oklahoma about 72 percent of the stalks survived to produce heads when the average plant had just reached the "Boot" stage by May 1. However, the 1957 harvest was delayed by excessive rainfall so that a longer period elapsed between May 1 and the average harvest date in 1957 than was encountered in 1956. The other 7 States, in which observations were made for the first time in 1957, also indicate that the stalk count decreases until harvest time. A lower survival rate was associated with the plants that were in a very early stage of development on May 1. In these 7 States, about 52 percent of the stalks that were present on May 1 produced heads in 1957. Data of this kind need to be collected for several years in order to determine the average survival rates and to investigate the factors that may affect year-to-year variation in those rates.

To make a yield forecast as of May 1, the weight of grain produced per head must be known as well as the number of heads that will be produced. In the absence of anything better, an average weight of grain per head for a given State or a given variety may be used. The average weight per head for mature heads in each of the 9 States is shown in Table 9.6. For a few States where grain was not entirely ripe by July 1, the weight of the head was estimated from the length of head by the relationships shown in Chart 9.2. For other crops, it has been possible to work out a relationship between the number of units of fruit produced by the average plant and the average weight of the fruit at maturity. It is possible that a similar relationship may ultimately be dis- covered in wheat, but data assembled so far are not sufficiently extensive to learn whether or not that is the case.

By June 1, most of the fields in all States contain at least some plants with heads which are at least in the "Boot" stage of maturity. Under these conditions it appears possible to forecast the number of heads that will be produced by a more refined procedure than assuming a fixed number of heads per stalk. This method makes use of a relationship between the percent of stalks with heads on June 1 and the ratio of the June 1 head count to the head count at maturity. That relationship is shown in Chart 9.1. For plants in the "Boot", "Milk", or "Soft Dough" stage, the ratio of the number of heads to the number of stalks is related to the ratio of the number of heads counted on June 1 to the number of heads at harvest. This relationship is approximately linear with a coefficient of determination of about 0.6. For plants that have not yet reached the "Boot" stage, stalk counts and survival rates can be used to esti- mate the number of heads as for the May 1 forecast. It appears that when heads have reached their full length, the weight of grain per head can be estimated from the length of head. But because the average length of head at maturity and the average weight of grain per head may show different relationships by varieties and by States, the practical application of this principle requires that the difference in average weight between two successive years be considered in relation to the difference in length for the same variety or for the same location.

Chart 9.2 shows in a general way how much change one can expect in the aver- age weight of head for a given change in length. By July 1, most of the crop has reached maturity so that an accurate indication of yield can be obtained by harvesting and threshing heads in the measured sampling units. For grain that
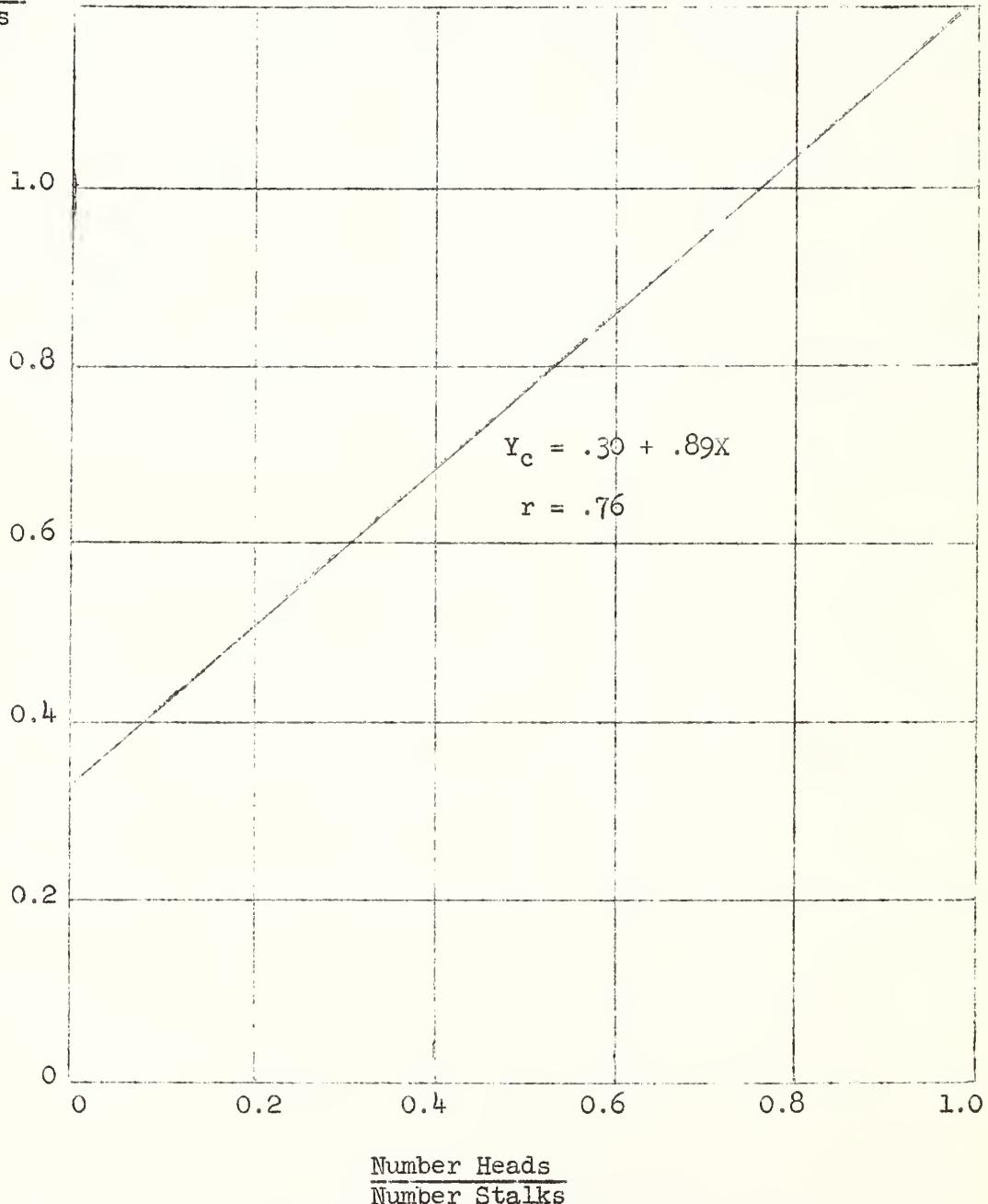
is not yet ripe, the average weight of grain per head computed from the ripe grain can be applied. For fields that have already been harvested by the farmer before harvest samples can be threshed, the head count obtained the previous month can be used in combination with the relationship between length of head and weight of grain per head as a substitute for a preharvest cutting. As an alternative, one can also use the farmer's estimate of yield per acre as a substitute for an objective indication in these fields.

Many of the relationships mentioned above need further refinement and some need more investigation. In early-season forecasts, a measure of plant maturity is needed for young wheat which has not yet begun to head out. Identical plots in the 1957 yield surveys showed that the product of plant height and number of stalks on May 1 has a surprisingly good relationship to the number of stalks formed on June 1. Obviously there is no assurance that wheat fields will be in the same stages of development on these two dates in future years. It is hoped that a node count will provide a suitable measure of plant maturity.

Data collected in England indicate that, for the same variety of wheat, the weight per head is closely related to head length. Those data also indicate that heads in the "Boot" have about 90 percent of their mature length and flowering heads about 95 percent. Because characteristic head shapes differ by varieties, the parameters of a weight-length relationship are likely to differ also. These differences need to be studied and parameters established for individual States, as well as for the region, to reflect varietal composition. Other factors may also be involved.
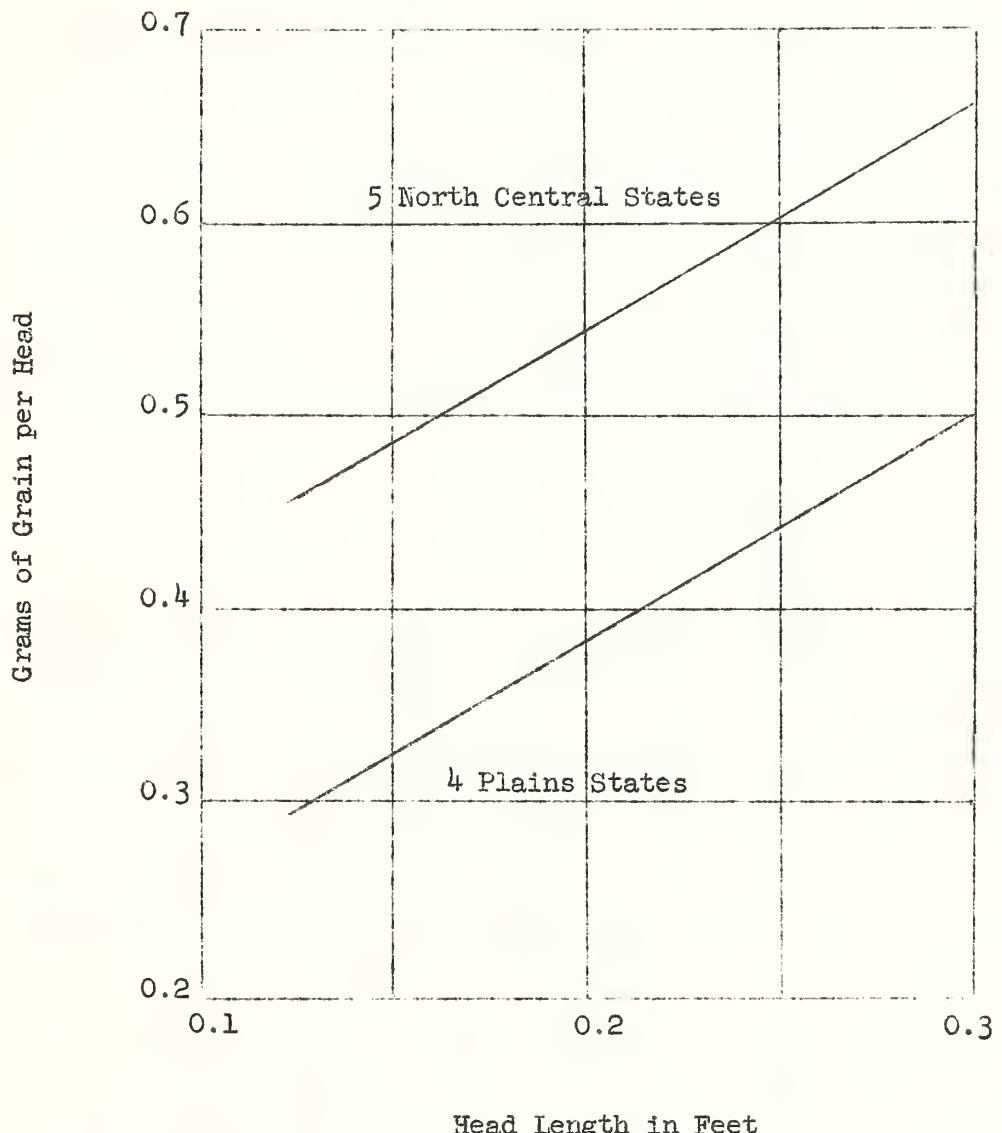
Chart 9.1--Relationship between Ratio of Head Numbers to Stalk
Numbers for Wheat in Shooting Stage 1/ and the Ratio
of Heads at Shooting Stage to Heads at Maturity, Identical
Plots, June 1957 Survey

$\dfrac{\text{Shooting Heads}}{\text{Mature Heads}}$

$$Y_c = .30 + .89X$$

$$r = .76$$

$\dfrac{\text{Number Heads}}{\text{Number Stalks}}$

1/ Boot, Flower, Milk or Soft Dough Stage of Maturity.

Chart 9.2--Relationship of Weight of Grain per Head of
Wheat to Length of Head, 1956-57 Yield Survey

10. Operations and Cost

10.1 General Operations

The Research Program operations in 1957 were similar to those in 1956 with the exception that more segments were covered in a number of States and some new States were added.

Sample segments for the June Survey were located in 1,323 counties in 30 States, including Arizona and California where the survey was limited to cotton acreages. All together 2,488 segments were enumerated by 291 interviewers under the supervision of 30 State Supervisors and 34 Supervisory Enumerators. An Acreage Verification Survey was made for a sample of tracts located in 605 segments. Acres harvested and crop production, livestock and poultry inventories and production were obtained as of October 1 and December 1 by enumerating 1,579 and 3,152 tracts respectively. The 1957 Objective Yield Program was expanded to include about 1,200 cotton, 1,400 corn, 173 soybean, and 350 winter wheat fields.

10.2 June Enumerative Survey

The Questionnaire

The June Enumerative Survey questionnaire was designed to allow all data for a complete segment to be recorded in columnar form on a single questionnaire, as in 1956. The questionnaire was divided into 7 sections as follows: Section I, Tract Identification; Section II, Fields and Crops in Segment; Section III, Livestock and Poultry in Segment; Section IV, Stocks of Grain in Segment; Section V, Entire Farm - Tenure, Class and Type; Section VI, Entire Farm Livestock and Poultry; Section VII, Farm Population, Employment and Wages.

Section I was used to list the name of the farm operator or the person in charge of each tract of land within the segment boundary. The operator's name and address and whether he lived within the segment were also listed.

Section II was set up in tabular form so that individual field data could be added and summarized on the questionnaire for each segment. Separate columns were provided for major crops. Identification numbers for tracts and fields were recorded at the side of the page, with a separate line for each field. Two regional questionnaires were used, one for the North Central States and one for the Southern States, thus allowing the Southern questionnaires to include such crops as cotton, peanuts, and tobacco, which were not included in the one for the North Central States.

Section III was designed in tabular form also. The questions were listed at the top of the columns with spaces for each tract on a separate line beneath. Cattle inventory, calf crop and milk production data were secured. Pig and hog inventories, pig farrowing within the last 6 months, and pig farrowing expected within the next 6 months were obtained along with some inventory information on sheep and chickens. All data in Section III were restricted to livestock within

the segment boundaries at the time of the interview. This presented little difficulty to the interviewer, because in most cases the farm operator could tell which of his "fields" in the segment contained livestock and poultry. Most farm operators, with a few probing questions, could tell where calves were born or where pigs had been farrowed or at least give a reasonable estimate of the same.

Section IV on stocks of corn, wheat, barley and rye asked for farm storage stocks of these grains located within the segment boundaries. These were also recorded in tabular form so that segment totals could be computed easily. This section gave little difficulty. Usually grain storage bins are easily located relative to segment boundaries.

Sections V, VI and VII were asked only of farm operators who lived inside the segment boundaries. In Section I the farm operator or the person in charge of the tract was recorded and a "Yes" or "No" answer was obtained to the question of whether he lived inside or outside the segment boundaries. If a "Yes" answer was recorded in Section I, the questions in Sections V, VI and VII were asked. The first part of Section V covered questions about acres of land owned, managed or rented, to obtain the total land operated by each respondent. These questions were followed by a series of questions to determine whether any agricultural products were being produced on that land for the operation to be correctly classified as "Farm" or Non-farm". The respondent was asked to pick a code number from a card to designate approximately the total value of crops and live- stock products sold from these acres in 1956. Thus, by picking a broad category, he did not have to give specific information regarding his income. There were some problems involved in Section V and there was some tendency for interviews to be concluded with this section that should have been continued through Section VI and VII. Section VI repeated the livestock and poultry questions used in the closed segment approach of Section III, but this time the questions applied to the entire farm as defined in Section V. This was confusing to some respondents who could not understand the reason for repeating the questions. In cases where the farmer's entire farm was in the segment boundaries, Section VI was not asked; instead the enumerators copied the figures for the various questions in Section III to Section VI. In some cases interviewers did not follow through on this and the editors had to make these corrections in the State offices.

Section VII, Farm Population, Employment and Wages, was a new section in 1957 and asked for a considerable amount of detail relating to people living on that farm, employment on that farm and related data. There were 22 questions in this section.

Training of Supervisors and Enumerators

Three-day training schools for State Supervisors and newly appointed Supervisory Enumerators were held in Lincoln, Nebraska and Atlanta, Georgia. There were 36 men in attendance from the Southern States at the Atlanta school and 30 men from the North Central and Western State offices at the Lincoln school. There were 6 Washington office representatives in attendance at Atlanta, and 4 plus a Central Area Administrative Officer at the Lincoln school. Training

sessions at regional schools were divided as follows. The first day classroom discussion took place from 8:00 a.m. until 5:30 p.m. On the second day the personnel were divided into Groups A and B. Group A attended classroom sessions in the morning and Group B took part in field work. That afternoon Group A did the field work while Group B attended classroom sessions. On the third day there was classroom discussion from 8:30 a.m. until 5:00 p.m.

Enumerator training schools were held in each State for a two and one-half day period. The training was divided as follows. The first day, from 8:00 a.m. to 5:30 p.m., consisted of classroom discussion, continuing the second day from 8:00 to 9:00 a.m. From 9:00 a.m. to 4:00 p.m. on the second day there was field practice. The group reassembled at 4:00 p.m. to review field experiences until 5:00 p.m. On the third day the group assembled at 8:00 a.m. until 12:00 noon, attending classroom sessions.

Enumerators

Enumerators were hired by State Statisticians at the rate of one for each 8 segments to be enumerated. They were paid $1.53 per hour and 7 cents per mile for official auto travel. During the training session they received $10.00 per diem for expenses. Two and one-half days salary was paid to each enumerator for the training period. The enumerators received $9.00 per diem when required to stay away from home during the actual survey. The manual of instructions for employment of enumerators was used in hiring enumerators and only minor difficulties were encountered in hiring adequate personnel.

Field and Washington Editing

State Supervisors and Supervisory Enumerators checked all questionnaires as received from enumerators for completeness and reasonableness of entries. In the early stages of the survey some questionnaires were returned to enumerators for correction or clarification. In other cases, especially later in the survey, the State Supervisor or his assistant contacted the enumerator by phone or in his travels to make the necessary corrections in the questionnaire. Detailed editing and summarization instructions were included in the Supervisors Manual.

Listing and Summary Sheets were checked off as received in Washington and given some spot editing by the Washington Staff. With the detailed editing required in the States little additional editing was required in Washington.

Time Required for Enumeration

The June Enumerative Survey was scheduled to be taken during the period from May 27 until about June 10. All materials were supposed to be in the State Statistician's offices by June 11.

The average time required to enumerate each segment during the June 1957 Enumerative Survey is summarized in Table 10.1. This shows the number of segments and the average time spent in completing the enumeration for each State. The time interviewers spent in each segment in the Southern States in 1957 averaged 8.5 hours, up slightly from the 8.1 hours recorded for 1956. In the North Central States the average time to enumerate a segment was 6.6 hours which was slightly below the 7.0 hours required the previous year. Four Western States were included this year with an average interview time per segment of 10.5 hours. This table also shows Arizona and California but it should be remembered that the work there was of a different nature than that for the other States. A study of this table reveals considerable variation in the amount of time required by States to complete a segment. The average varies from 12.2 hours per segment in Wyoming to 3.8 hours in Indiana. The column entitled "Total Hours" is the total time for which enumerators, assistant supervisors and State Supervisors were paid during the survey proper. This includes time for driving to and from the segment, checking over the work, sending materials to the State office, and meetings between supervisors and enumerators. The data indicate that there were about three hours of supervisory time spent per segment in the South, 2.5 hours in the North Central States, and 9.1 hours in the West.

Table 10.1--Average Enumeration Time per Segment
June 1957 Enumerative Survey

State and Region	No. of segments	Total time worked			Enumerator time in segment
		Enumerator	Supervisor	Total	
	Hours	Hours	Hours	Hours	Hours
Ala.	100	10.2	3.5	13.7	8.7
Ark.	127	9.3	2.3	11.6	6.6
Ga.	121	10.9	2.7	13.6	8.5
Ky.	129	10.1	2.4	12.5	7.4
La.	101	12.5	3.2	15.7	9.4
Miss.	300	9.3	2.1	11.4	7.0
N. C.	155	15.6	3.6	19.2	10.8
Okla.	116	11.3	3.8	15.1	6.9
S. C.	91	12.5	2.8	15.3	9.7
Tenn.	107	10.8	2.6	13.4	7.7
Tex.	232	11.9	3.9	15.8	9.8
Va.	109	10.3	3.8	14.1	9.1
South	1688	11.1	3.0	14.1	8.5
Ill.	51	10.9	1.9	12.8	9.2
Ind.	48	5.7	.8	6.5	3.8
Iowa	55	8.7	3.4	12.1	6.0
Kan.	50	7.5	1.9	9.4	6.6
Mich.	46	6.2	1.9	8.1	5.9
Minn.	42	9.3	2.8	12.1	6.4
Mo.	55	7.4	2.8	10.2	5.1
Nebr.	50	9.2	2.3	11.5	6.5
N. D.	40	14.4	3.0	17.4	7.9
Ohio	49	5.4	2.8	8.2	6.2
S. D.	40	10.4	1.7	12.1	8.5
Wisc.	43	11.2	5.0	16.2	7.5
North Central	569	8.7	2.5	11.2	6.6
Colo.	40	13.1	6.1	19.2	7.2
Mont.	40	15.0	22.1	37.1	11.6
N. Mex.	40	14.8	2.0	16.8	11.1
Wyo.	40	23.1	6.0	29.1	12.2
West	160	16.5	9.1	25.6	10.5
Total	2417	10.9	3.3	14.2	8.2
Ariz. 1/	30	6.5	.5	7.0	-
Calif. 1/	41	4.4	1.3	5.7	-
Ariz. & Calif. 1/	71	5.3	1.0	6.3	-
Total	2488	10.8	3.2	14.0	-

1/ The work in Arizona and California was a screening process and not comparable with the other States.

State Expense of Operating the June Survey

The operating expenses for the June 1957 Research Survey are shown in the following two tables. This information was prepared from the summary of survey field costs submitted by the State offices. Table 10.2 shows the number of persons involved and the average cost per person for training supervisors and for hiring and training enumerators.

Out-of-pocket expenses are funds which States spent because this particular survey was made. The difference between total and out-of-pocket expense represents salary cost of the full-time office staff. This is covered by the allocation of additional salary funds for the State offices. Essentially the difference between total and out-of-pocket expenses is this -- even if the survey were not made, certain costs would still be incurred if it were necessary to maintain existing regular personnel and facilities. However, to measure actual survey costs there must be good records of absorbed costs in addition to records of out-of-pocket expenses.

Table 10.3 lists the average cost per segment by States and regions. These are the vital cost figures used in estimating costs and allocating funds for future surveys. Expenses occurring from the time the enumerator finishes his formal training until the time his field assignment is completed are included under the heading "Survey Proper." This record includes travel expenses of the State Supervisor and salary and traveling expenses of the Supervisory Enumerator during the enumeration phase of the survey.

The two columns headed "Total" include all field expenses of the survey, both out-of-pocket and regular salary cost, including the hiring and training of supervisors and interviewers and all field work required.

A brief study of the last two columns in Table 10.3 shows the geographic variation in these costs. Costs reflect the variety of problems involved in conducting enumerative surveys in the various areas of the country.

1957 Acreage Verification Study

The Acreage Verification conducted for the June 1957 Enumerative Survey was somewhat different from that of 1956, inasmuch as the fields were not actually chained. Certain tracts were revisited by the Supervisor or Supervisory Enumerator who checked these areas to see that the enumerator had corrected outlined the individual fields and had correctly recorded the information. Any necessary corrections in field boundaries were made on the photo with a green pencil.

A summary of all tracts was prepared for corn, cotton, soybeans and tobacco and forwarded to Washington by June 27. This summary showed the acreage listed for the designated crop in columns 5 and 7 of the tract work sheet. A second phase of the work required that each field or sub-division devoted to crops be planimetered or rotometered. Actually, planimetering as a quality check for this work was found to be difficult to evaluate due to differences in planimetering and the fact that the widths of the colored pencils used for field lines could cause considerable variations. Thus errors could not be pinpointed as to source. Costs involved in the Acreage Verification Study are combined with the June Enumerative Survey in Table 10.3. There are no separate cost comparisons for the quality check as such.

Table 10.2--June 1957 Research Hiring and Training Costs per Person

State and Region	Supv. Enum.	Enum.	Average cost per person					
			Supervisor training		Hiring enumerators		Enumerator training	
			Out of pocket	Total	Out of pocket	Total	Out of pocket	Total
	No.	No.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.
Ala.	2	12	111.48	130.29	3.55	21.96	68.16	74.83
Ark.	1	15	91.67	118.47	3.49	28.62	76.95	100.08
Ga.	2	15	92.42	171.34	15.65	45.55	84.81	93.82
Ky.	2	15	128.06	157.74	13.99	48.91	84.18	97.12
La.	2	12	124.82	153.89	9.39	27.10	70.24	80.47
Miss.	3	35	124.80	156.36	5.93	28.89	79.76	85.06
N. C.	2	21	126.68	159.86	8.10	39.51	100.56	117.35
Okla.	2	11	195.65	263.49	24.52	58.69	71.74	90.79
S. C.	1	11	73.68	131.69	16.43	56.25	61.46	85.06
Tenn.	2	13	89.00	149.80	12.31	42.08	82.49	101.29
Tex.	3	26	151.35	203.35	24.62	41.24	77.54	105.09
Va.	2	12	149.04	168.57	4.50	37.38	77.06	91.04
South	24	198	122.42	164.59	11.85	38.49	79.37	94.57
Ill.	1	8	143.46	182.70	11.42	29.49	69.26	81.92
Ind.	1	3	138.56	199.04	--	--	30.71	39.35
Iowa	1	6	81.02	123.84	14.73	28.38	84.57	96.81
Kan.	0	7	49.00	91.32	1.06	13.54	76.46	86.42
Mich.	0	5	116.90	293.80	--	2.05	69.35	106.04
Minn.	1	6	126.56	217.20	--	23.52	85.77	116.27
Mo.	0	6	93.20	254.90	2.35	11.92	29.51	57.74
Nebr.	1	5	48.35	76.51	27.16	28.33	75.91	90.28
N. D.	1	5	102.24	148.08	11.67	50.63	78.35	99.71
Ohio	0	5	79.75	142.04	1.04	4.04	52.07	96.00
S. D.	1	4	62.36	115.40	--	--	23.78	36.86
Wisc.	0	5	106.45	192.21	19.78	43.63	98.82	118.66
North Cent.	7	65	98.96	166.66	7.84	21.11	66.62	87.02
Colo.	1	6	155.99	317.26	--	44.06	77.82	106.03
Mont.	1	6	210.62	255.42	26.88	52.53	109.78	128.34
N. Mex.	0	5	99.75	141.67	9.80	31.94	98.32	124.32
Wyo.	1	7	340.24	564.40	27.95	57.18	95.00	109.01
West	3	24	181.85	284.73	17.07	47.90	94.99	116.09
Ariz.	0	2	42.00	94.32	--	89.46	24.80	45.76
Calif.	0	2	239.25	475.25	59.30	140.80	26.18	79.68
Ariz. & Calif.	0	4	140.62	284.78	29.65	115.13	25.49	62.72
Total	34	291	122.17	181.34	11.61	36.37	77.18	94.29

Table 10.3--June 1957 Research Enumeration and Summarization
Costs per Segment

State and Region	Segments	Average cost per segment					
		Survey proper		Editing & summarizing		Total	
		Out of pocket	Total	Out of pocket	Total	Out of pocket	Total
	No.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.
Ala.	100	35.51	37.24	1.62	3.26	51.41	58.85
Ark.	127	28.92	33.51	1.09	6.48	43.04	59.73
Ga.	121	35.92	38.38	3.32	9.50	57.59	73.65
Ky.	129	30.61	33.51	4.76	5.74	52.64	63.52
La.	101	38.65	41.77	--	4.61	54.68	67.15
Miss.	300	28.29	30.41	1.69	3.46	43.56	51.45
N. C.	155	46.32	51.91	3.12	10.45	70.89	91.60
Okla.	116	48.42	51.60	--	3.35	65.36	79.61
S. C.	91	35.81	39.84	3.87	8.36	54.28	73.10
Tenn.	107	37.15	39.12	4.15	10.31	58.68	75.32
Tex.	232	46.43	50.74	1.03	4.30	65.62	79.35
Va.	109	33.67	39.63	.94	2.43	50.62	64.63
South	1688	36.96	40.42	2.04	5.70	55.38	68.95
Ill.	51	33.21	35.95	3.17	8.01	57.16	71.70
Ind.	48	19.70	19.70	1.53	2.42	29.89	34.01
Iowa	55	29.92	34.59	6.29	8.92	52.82	64.96
Kan.	50	24.81	28.99	--	5.26	38.38	52.66
Mich.	46	21.65	26.65	--	5.15	32.18	50.43
Minn.	42	38.33	41.98	1.34	5.48	61.40	82.51
Mo.	55	29.83	41.90	1.06	2.18	37.96	58.21
Nebr.	50	34.61	36.87	--	7.02	51.30	63.57
N. D.	40	50.81	54.44	5.98	10.43	77.11	96.53
Ohio	49	18.92	24.72	1.02	9.96	29.06	51.14
S. D.	40	45.24	46.55	1.86	9.94	53.23	66.90
Wisc.	43	31.82	44.65	--	10.97	48.53	79.41
North Cent.	569	31.00	35.92	1.86	7.01	46.77	63.48
Colo.	40	58.51	64.33	5.13	14.82	86.87	123.09
Mont.	40	78.63	109.86	.73	5.49	116.08	162.05
N. Mex.	40	52.45	58.50	--	5.29	73.33	92.78
Wyo.	40	81.48	86.80	--	8.79	118.01	146.38
West	160	67.77	79.88	1.46	8.60	98.57	131.07
Ariz.	30	20.37	21.82	.13	3.01	26.55	39.99
Calif.	41	14.01	19.38	--	2.46	24.41	44.58
Ariz. & Calif.	71	16.70	20.41	.05	2.69	25.31	42.64
Total	2488	37.00	41.37	1.91	6.10	55.33	70.94

10.3 October 1 and December 1 Surveys

The October 1 and December 1 Surveys were made on an enumerative basis in 1957, the same as in 1956. In addition to the crop acreage and production questions which have been asked in previous October 1 surveys, the October 1957 questionnaire contained a section on livestock inventories. For the October Survey, a sample of one-eighth of the operator tracts in the North and West and one-twentieth of the tracts in the South for which some crops or livestock had been reported in June were selected for enumeration. For the December Survey, the sample consisted of one-fourth of the tracts in the North and West and one-tenth of the Southern tracts enumerated in June. The selection of these December tracts was made in such a manner as to exclude any previously selected for the October Survey. Field work on the two surveys was carried out largely during the last full week in September and November respectively and travel was combined with travel for the Objective Yield Surveys insofar as possible. In the South, 855 tracts were selected for October 1 enumeration and 1,610 for the December Survey. In the North Central States, 511 tracts were selected for October and 1,022 for December. In the Western States, 213 tracts were selected for October and 426 tracts for December.

Listing sheets for both surveys were prepared in Washington and comparable data from the June questionnaires for each tract were copied to the listing sheets and forwarded to the State. The State Supervisor then edited and listed the current survey data and prepared estimates from the data to be submitted to Washington for combination with other States for regional totals.

October and December Questionnaires

Regional questionnaires were not used for the October 1 and the December 1 surveys. Crops for each tract were listed field by field from the June questionnaire. The format for recording data was such that the same line on which the June data was recorded would also be filled in for October or December. The questionnaires for October and December were designed to obtain data for one tract per questionnaire.

Crop data were recorded on the closed segment basis for the same fields enumerated in the tract in June. In these surveys, however, the acreage for a crop was recorded for planted acreage, acreage harvested for each utilization, and acreage otherwise used or abandoned. Production reports were required with all reports of harvested acreage.

The crop section in the December questionnaire was almost identical to that for the October 1 Survey. Naturally, at this stage of the harvest more emphasis was placed on the late fall harvested crops which were not yet harvested at the time of the October 1 Survey. There was also a section in the December 1 Survey asking for the acreage of small grains in the tract seeded for harvest in 1958. These included winter wheat, winter oats, winter barley, rye and mixed grains. These data were recorded, field by field, as outlined on the June aerial photos. The same set of livestock and poultry questions was again asked on the

closed segment basis in December. Acreage on the entire farm (open segment) was obtained by asking farm operators living in the segment questions on acres of all land owned and rented. On this land the enumerator determined the total number of cattle and calves, hogs and pigs, sheep and lambs, chickens and the expected changes in these inventories from the time of the December 1 Survey until January 1, 1958.

Interviewers for the October and December Surveys

In most cases the interviewing done at the time of those two surveys was accomplished by Supervisory Enumerators and enumerators previously used in the June Survey. However, when experienced enumerators were not available, a new man had to be found and trained for the job. Enumerator training for the October and December Enumerative Surveys varied from State to State. In some States the interviewers came to the State office and received approximately one day of instruction. In many other cases the State Supervisor or Supervisory Enumerator traveled to the interviewer's home and trained him through informal instruction supplemented by on-the-job practice.

Enumerators sent completed questionnaires to the State office each day, allowing the Supervisor to measure the progress of the man and the quality of his work. Aerial photographs and other supplies were returned to the State offices at the end of the interviewing period.

Editing and Tabulation of the October and December Questionnaires

As the questionnaires were received the State Supervisor edited them independently of the data recorded in June for the same tract. After the question-naires were edited they were listed with corresponding June data for each tract and field. The listing sheets were edited after listing. If tract or field data were edited out for one survey they were also edited out for the other survey to maintain comparability of data. The State offices then summarized livestock and crop items and forwarded results to Washington, meeting the due dates originally set up in the project.

Costs of the October 1 and December 1 Enumerative Surveys

Costs specifically associated with the October 1 or December 1 Enumerative Surveys cannot be calculated separately. Many of the interviewers made Objective Yield observations during the same period they were carrying on the Enumerative Survey work; therefore, expenses could not be allocated accurately to Objective Yield Survey costs and Enumerative Survey costs. Costs of these two enumerative surveys are included in Tables 10.8 and 10.10 with the Objective Yield Surveys for those months. Whenever two types of surveys are carried on at the same time by the same people, it is impossible to obtain a precise breakdown of costs to be charged to the surveys individually.

10.4 1957 Objective Yield Surveys

The objective yield work for 1957 was divided into three rather distinct parts; (1) surveys on winter wheat, for May 1, June 1, July 1 and post-harvest observations of sample wheat fields; (2) cotton and corn yield surveys in the Southern States as of August 1, September 1, October 1, and post-harvest observations made later in the fall; and (3) corn and soybean surveys in the North Central States as of August 1, September 1, October 1, November 1, and post-harvest observations later in the year.

Wheat surveys were conducted in the following 9 States: Oklahoma, Texas, Illinois, Indiana, Kansas, Michigan, Missouri, Nebraska and Ohio. Two wheat laboratories were established, one at the Oklahoma office and the other at the Kansas office, for determining weight and length of heads, and moisture of sample heads clipped from sample plots in the 9 States. The Oklahoma and Texas offices used the laboratory in Oklahoma City, while the other States mailed samples to Kansas. Of the 334 samples selected, 91 were in Oklahoma, 42 in Texas, 19 in Illinois, 13 in Indiana, 67 in Kansas, 15 in Michigan, 38 in Missouri, 27 in Nebraska and 22 in Ohio. Table 10.4 shows the 1957 wheat survey field costs. The average cost per sample for all 9 States, including absorbed costs and the laboratory processing of the samples, was $40.70 per sample.

The objective yield program for cotton in 1957 involved 10 Southern States with a total of about 1,100 samples, as shown in Table 10.5-South. Cotton fields were also sampled in Arizona, California and New Mexico to the extent of 110 additional samples. Kentucky and Virginia had no cotton samples. The Southern States program also included 720 corn samples. In the 11 North Central States, 173 soybean fields and 680 corn fields were visited with State distribution as shown in Table 10.5-North Central. However, the August 1 Survey consisted of a subsample of these fields and not until September 1 were all fields visited.

The laboratory work for the fields sampled in the Southern States was handled individually by States. In some cases laboratory equipment was available through cooperating State agencies or other Department of Agriculture agencies. For the North Central States a soybean laboratory was again operated in the Illinois State office, and corn samples were sent to the Statistical Laboratory at Iowa State College for analysis.

Table 10.4--1957 Wheat Survey Field Costs

State	Samples	Total field expense		Average cost per sample			
				Survey proper		Total	
		Out of pocket	Total	Out of pocket	Total	Out of pocket	Total
	No.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.
Ill.	19	313	722	10.82	25.35	16.47	37.99
Ind.	13	857	1,008	52.90	52.90	65.91	77.54
Kan.	67	1,494	2,380	17.64	21.41	22.30	35.53
Mich.	15	845	1,529	42.59	58.74	56.34	101.91
Mo.	38	1,691	2,822	40.10	57.08	44.50	74.26
Nebr.	27	1,009	1,394	27.62	35.27	37.36	51.64
Ohio	22	1,287	1,671	48.76	48.76	58.49	75.94
Okla.	91	2,222	2,910	20.33	23.04	24.42	31.97
Tex.	42	629	1,010	9.69	14.16	14.97	24.04
Total	334	10,347	15,446	24.89	31.05	30.98	46.24
Lab. work							
Okla.	133	281	319	1.83	1.93	2.11	2.40
Kan.	201	138	501	.68	2.49	.69	2.49
Total	334	10,766	16,266	26.03	33.31	32.23	48.70

Table 10.5--Number of Sample Fields and Enumerators

State	August 1			Enum-erator 1/	Sept. 1, Oct. 1, Nov. 1			Enumerator 1/
	Fields				Fields			
	Soybeans	Corn	Total		Soybeans	Corn	Total	
	No.	No.	No.	No.	No.	No.	No.	No.
Ill.	24	28	52	0	48	113	161	8
Ind.	9	14	23	1	17	57	74	3
Iowa	11	34	45	0	23	138	161	6
Kan.	3	5	8	0	6	17	23	1
Mich.	3	5	8	0	6	23	29	4
Minn.	10	19	29	0	19	75	94	3
Mo.	7	19	26	1	14	75	89	6
Nebr.	3	13	16	0	6	52	58	2
Ohio	11	11	22	1	22	46	68	3
S. D.	3	12	15	2	6	48	54	3
Wisc.	3	9	12	3	6	36	42	3
Total	87	169	256	8	173	680	853	42

State	Fields - all months			Enum-erator 1/
	Cotton	Corn	Total	
	No.	No.	No.	No.
Ala.	70	70	140	4
Ark.	125	50	175	6
Ga.	70	70	140	7
Ky. 2/	--	70	70	1
La.	70	50	120	6
Miss.	125	50	175	6
N. C.	70	70	140	6
Okla.	70	50	120	5
S. C.	70	50	120	8
Tenn.	70	70	140	5
Tex.	250	70	320	13
Va.	--	50	50	0
Total	1,110	720	1,830	67
Ariz.	30	--	30	4
Calif.	50	--	50	4
N. Mex.	30	--	30	2
Total	110	--	110	10

1/ In States with zero entries all survey work was performed by regular State personnel.

2/ Kentucky also visited 70 fields in a Burley tobacco survey.

Enumerators and Supervisors for the Objective Yield Work

In most cases the Supervisory Enumerators and some of the better enumerators used in the June Survey work did the field work on the objective yield surveys. In most cases the teams consisted of only one man, although there were some areas where two men worked as a team in training or in doing the actual field work.

Supervisory training schools were held in Little Rock, Arkansas and Columbia, Missouri. The school at Little Rock was attended by supervisors from the Southern and Western States. The school started at 8:00 a.m., July 15 and ended 5:00 p.m., July 16. Supervisors from the Northern States attended the school at Columbia from 8:00 a.m., July 18 until 5:00 p.m., July 19. At these schools the Supervisors and Supervisory Enumerators in attendance were able to go into the field with members of the Washington staff to observe and practice some of the techniques involved in the objective yield work.

Enumerator training for the individual States varied somewhat, depending upon the experience of the individuals concerned. Most of the training by the supervisor was in the nature of visiting and training enumerators at their homes or spending a day interviewing and making counts with the enumerators. In some cases formal schools were held for the enumerators. The training and supervisory materials which were given to the State Supervisors contained rather rigid rules on procedures. The August 1 Survey in the North Central States was conducted by the State Supervisors or the Supervisory Enumerators because only a few of the fields were visited. Training of other field workers was not conducted until shortly before the September 1 Survey. Only limited supervision of enumerators took place during the objective yield work, but more active supervision would be desirable.

The State Supervisors received the questionnaires in the field offices, edited them, and made corrections as required. The questionnaires were listed, summarized and forwarded to Washington to meet the specified due dates. A critical problem in putting an objective yield program into an operating phase is the meeting of due dates; in these instances the due dates were of a practical nature and were met.

Questionnaires Used for Objective Yield Work

The questionnaires for cotton, corn and wheat were modified versions of those used in preceding years. This was the second year for the soybean yield study and soybean questionnaires were modified versions of the ones used the previous year.

Survey Costs for the Objective Yield Work

Tables 10.6 through 10.10 contain detailed cost records by months for the Objective Yield Surveys on corn, cotton, and soybeans. Because of the considerable detail included in these tables, no simple explanation of variations is possible. A few words may be helpful, however. The difference between the

survey proper and the total cost for the August 1 Survey is primarily due to costs of training the State Supervisors and Supervisory Enumerators at the regional school. In the September 1 Survey in the South, the survey proper accounts for almost all the cost of the survey. However, in the North Central States the difference between the survey proper and total cost is practically all accounted for by training additional enumerators. Very little cost in either case was attributed to hiring enumerators or editing questionnaires.

As mentioned earlier, the October 1 survey costs include both the Objective Yield Survey and the October Enumerative Survey. This accounts for the increase in the number of questionnaires shown under the heading "sample", which is footnoted, "Includes number of tracts selected for October 1 Enumerative Survey and number of objective yield samples visited." Note that some States carry the footnote "3/" which calls attention to the fact that only the Enumerative Survey took place; no objective yield work was being carried on in those States.

The costs of the November 1, 1957 Survey apply only to the North Central region where a formal objective yield survey was conducted. During November and the latter part of October, enumerators were conducting post-harvest observations in the South, and their expenses have been included with the December 1 survey costs.

December 1 costs include the Objective Yield and the December Enumerative Survey costs. The number of questionnaires taken in these two surveys is shown. Additional training of enumerators was conducted in some States. Other States showed no expense for additional training of enumerators.

Table 10.6--August 1, 1957 Objective Yield Costs

| State | Samples | Total cost | | Cost per sample | | | |
| | | | | Survey proper | | All | |
		Out of pocket	Total	Out of pocket	Total	Out of pocket	Total
	No.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.
Ala.	140	1,613	1,979	8.38	9.02	11.52	14.14
Ark.	175	1,933	2,872	8.28	10.39	11.05	16.41
Ga.	140	1,837	2,569	8.06	9.62	13.12	18.35
Ky. 1/	168	1,424	1,772	6.59	7.43	8.47	10.55
La.	120	1,464	1,831	9.00	9.70	12.20	15.26
Miss.	175	2,323	2,828	9.84	10.91	13.27	16.16
N. C.	140	3,590	4,377	18.64	22.50	25.64	31.26
Okla.	120	1,304	1,836	8.47	9.43	10.87	15.30
S. C.	120	1,720	2,007	10.00	10.42	14.33	16.72
Tenn.	140	1,426	2,284	6.37	8.43	10.19	16.32
Tex.	320	4,686	5,454	9.47	10.30	14.78	17.20
Va.	50	824	1,261	12.86	17.89	16.49	25.22
South	1,808	24,144	31,070	9.43	10.87	13.38	17.21
Ill.	52	518	751	8.64	11.87	9.96	14.45
Ind.	23	470	483	11.72	11.72	20.44	21.00
Iowa	45	638	843	9.41	9.99	14.18	18.74
Kan.	8	82	254	6.26	19.34	10.23	31.76
Mich.	8	178	413	7.78	22.65	22.30	51.58
Minn.	29	509	853	11.38	14.43	17.56	29.40
Mo.	26	197	714	6.35	20.19	7.60	27.48
Nebr.	16	247	484	10.94	19.66	15.42	30.24
Ohio	22	428	777	1.77	6.24	19.44	35.32
S. D.	15	413	559	18.90	22.01	27.51	37.30
Wisc.	12	483	862	32.74	53.10	40.24	71.82
North Cent.	256	4,163	6,993	10.31	15.76	16.26	27.32
Ariz.	30	853	1,149	16.38	18.08	29.23	39.10
Calif.	50	1,274	2,110	15.85	21.29	25.49	42.21
N. Mex.	30	719	1,152	7.88	13.84	21.78	34.90
West	110	2,846	4,411	13.66	18.26	25.18	39.03
Total	2,174	31,153	42,474	9.75	11.83	14.33	19.54

1/ Includes 98 Burley tobacco samples and costs.

Table 10.7--September 1, 1957 Objective Yield Costs

State and Region	Samples visited	Total costs		Cost per sample			
		Out of pocket	Total	Survey proper		All	
				Out of pocket	Total	Out of pocket	Total
	No.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.
Ala.	134	1,004	1,202	6.65	6.84	7.49	8.97
Ark.	153	1,264	1,553	7.55	7.71	8.26	10.15
Ga.	126	871	1,137	6.24	6.69	6.91	9.03
Ky.	62	621	780	8.64	10.16	10.01	12.58
La.	103	851	954	7.73	8.16	8.26	9.26
Miss.	163	1,462	1,857	8.85	10.04	8.97	11.39
N. C.	137	1,779	2,629	10.83	12.90	12.98	19.19
Okla.	102	1,134	1,601	9.65	11.76	11.12	15.69
S. C.	119	761	890	5.81	6.30	6.40	7.48
Tenn.	133	843	1,290	5.38	6.40	6.34	9.70
Tex.	266	2,086	2,496	7.54	8.39	7.84	9.38
Va.	49	423	657	8.27	11.70	8.64	13.41
South	1,547	13,099	17,046	7.69	8.67	8.47	11.02
Soybean Lab	132	97	173	.72	1.30	.74	1.31
Ill.	152	1,808	2,126	8.67	9.32	11.90	13.98
Ind.	74	690	711	6.38	6.38	9.32	9.61
Iowa	149	2,027	2,339	10.45	10.66	13.60	15.70
Kan.	22	39	148	1.71	5.68	1.77	6.72
Mich.	29	378	558	10.87	12.80	13.04	19.23
Minn.	94	964	1,404	9.42	10.42	10.25	14.94
Mo.	85	899	1,327	9.47	11.61	10.57	15.61
Nebr.	55	636	889	10.31	13.91	11.57	16.16
Ohio	64	406	733	5.41	7.44	6.34	11.46
S. D.	52	644	720	10.09	10.43	12.39	13.86
Wisc.	42	605	1,155	14.27	23.02	14.40	27.49
North Cent.	818	9,193	12,283	9.20	10.83	11.24	15.02
Ariz.	30	558	701	16.79	18.55	18.60	23.37
Calif.	44	632	913	14.14	14.93	14.38	20.74
N. Mex.	30	271	461	7.78	11.63	8.21	13.98
West	104	1,461	2,075	13.30	15.36	14.05	19.95
Total	2,469	23,753	31,404	8.42	9.67	9.62	12.72

Table 10.8--October 1957 Objective Yield and Enumerative
Survey Costs

State and Region	Samples 1/	Total costs		Cost per sample			
		Out of pocket	Total	Survey proper		All	
				Out of pocket	Total	Out of pocket	Total
	No.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.
Ala.	187	1,016	1,357	4.63	5.26	5.43	7.26
Ark.	187	1,613	2,129	7.30	8.00	8.63	11.39
Ga.	158	1,089	1,550	4.89	6.07	6.89	9.81
Ky.	129	976	1,349	6.18	8.09	7.57	10.45
La.	156	925	1,188	5.56	5.79	5.93	7.61
Miss.	299	2,056	2,489	5.72	6.00	6.88	8.32
N. C.	194	1,739	2,623	7.44	9.15	8.96	13.52
Okla.	128	1,119	1,628	7.92	9.99	8.74	12.72
S. C.	165	846	1,185	4.61	4.99	5.13	7.18
Tenn.	192	817	1,622	4.21	5.92	4.25	8.45
Tex.	331	2,782	3,459	7.71	8.72	8.40	10.45
Va.	118	841	1,152	6.71	9.35	7.13	9.76
South	2,244	15,819	21,731	6.13	7.21	7.05	9.68
Ill.	188	1,169	1,462	6.05	6.58	6.22	7.77
Ind.	105	727	744	5.79	5.79	6.92	7.09
Iowa	184	1,981	2,078	8.22	8.22	10.76	11.29
Kan.	64	178	645	.48	5.20	2.78	10.08
Mich.	73	516	820	5.59	7.17	7.07	11.23
Minn.	127	956	1,274	6.31	6.58	7.53	10.03
Mo.	113	934	1,382	6.98	8.72	8.27	12.23
Nebr.	97	651	922	6.00	6.43	6.72	9.51
Ohio	127	541	788	3.92	4.53	4.26	6.21
S. D.	88	666	788	7.42	8.41	7.57	8.95
Wisc.	85	739	1,011	8.61	11.03	8.69	11.89
North Cent.	1,251	9,058	11,914	6.20	7.12	7.24	9.52
Ariz. 2/	30	452	570	14.75	16.04	15.07	18.98
Calif. 2/	44	721	998	15.33	17.69	16.39	22.69
N. Mex.	66	712	1,116	9.35	12.96	10.79	16.91
West	140	1,885	2,684	12.39	15.11	13.47	19.17
Colo. 3/	41	883	1,566	18.02	19.67	21.54	38.19
Mont. 3/	43	1,196	1,539	20.85	22.37	27.80	35.79
N. D. 3/	34	534	888	12.91	13.52	15.72	26.13
Wyo. 3/	45	961	1,335	16.88	19.65	21.36	29.66
Total	163	3,574	5,328	17.39	19.10	21.93	32.69
Grand Total	3,798	30,336	41,657	6.86	7.98	7.99	10.97

1/ Includes number of tracts selected for October 1 Enumerative Survey and number
of objective yield samples visited.
2/ Objective Yield Survey only.
3/ Enumerative Survey only.

Table 10.9--November 1, 1957 Objective Yield Survey Costs

State and Region	Samples	Total cost		Cost per sample			
		Out of pocket	Total	Survey proper		All	
				Out of pocket	Total	Out of pocket	Total
	No.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.
Ill.	39	671	710	16.91	16.91	17.21	18.22
Ind.	18	496	496	25.32	25.32	27.54	27.54
Iowa	(See December)						
Kan.	16	13	65	.74	3.96	.82	4.04
Mich.	16	142	218	8.41	9.06	8.90	13.62
Minn.	18	523	714	26.79	31.92	29.05	39.69
Mo.	0						
Nebr.	11	360	435	24.73	26.49	32.77	39.54
Ohio	42	329	476	6.53	7.21	7.83	11.34
S. D.	0						
Wisc.	19	403	586	21.04	26.83	21.22	30.82
North Cent.	179	2,937	3,700	15.03	16.77	16.41	20.67
Ariz.	7	95	191	11.19	13.18	13.51	27.34
Calif.	12	128	222	10.62	14.04	10.70	18.45
New Mex.	6	5	89	.76	7.33	.76	14.79
West	25	228	502	8.41	12.19	9.10	20.06
Total	204	3,165	4,202	14.22	16.21	15.52	20.60

Table 10.10--December 1957 Objective Yield and Enumerative Survey Costs

State and Region	Sched-ules 1/	Total cost		Cost per schedule			
				Survey proper		All	
		Out of pocket	Total	Out of pocket	Total	Out of pocket	Total
	No.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.
Ala.	233	1,179	1,649	5.00	5.75	5.06	7.08
Ark.	240	1,374	1,806	5.42	6.06	5.73	7.53
Ga.	229	1,270	2,096	5.37	6.46	5.55	9.15
Ky. 2/	305	2,355	3,256	5.92	7.49	7.72	10.68
La.	205	1,187	1,513	5.57	5.83	5.79	7.38
Miss.	406	2,237	2,984	5.38	6.12	5.51	7.35
N. C.	277	2,168	3,577	6.91	9.77	7.83	12.92
Okla.	136	1,407	1,922	9.14	10.42	10.35	14.13
S. C.	208	1,141	1,542	5.40	6.19	5.48	7.41
Tenn.	252	1,265	1,999	4.79	6.22	5.02	7.93
Tex.	524	2,942	3,973	4.98	5.92	5.61	7.58
Va.	162	562	914	3.36	4.19	3.47	5.64
South	3,177	19,087	27,231	5.50	6.61	6.01	8.57
Ill.	216	722	922	3.28	3.60	3.34	4.27
Ind.	135	562	579	2.81	2.81	4.16	4.29
Iowa 3/	263	1,497	1,611	4.47	4.47	5.69	6.12
Kan.	112	405	861	3.55	6.91	3.62	7.69
Mich.	119	499	885	3.38	4.00	4.19	7.44
Minn.	138	716	1,082	4.80	5.32	5.19	7.84
Mo.	163	1,622	2,168	8.34	11.05	9.95	13.30
Nebr.	133	889	1,138	6.14	6.88	6.68	8.56
Ohio	183	572	892	2.83	3.37	3.13	4.87
S. D.	111	731	1,039	6.49	7.53	6.58	9.36
Wisc.	121	845	1,144	6.92	7.27	6.98	9.45
North Cent	1,694	9,060	12,321	4.71	5.53	5.35	7.27
Colo. 4/	82	588	1,206	5.77	6.76	7.17	14.71
Mont. 4/	84	933	1,180	9.51	10.61	11.10	14.04
N. D. 4/	68	595	1,017	7.52	8.37	8.75	14.96
N. Mex.	100	1,404	1,700	12.40	14.06	14.04	17.00
Wyo. 4/	90	1,052	1,458	11.44	13.47	11.69	16.20
West	424	4,572	6,561	9.56	10.93	10.78	15.47
Ariz.	30	397	554	12.69	14.08	13.23	18.46
Calif.	50	466	588	9.22	11.20	9.32	11.76
Ariz. & Calif.	80	863	1,142	10.52	12.28	10.79	14.27
TOTAL	5,375	33,582	47,255	5.65	6.70	6.25	8.79

1/ Includes objective yield samples visited plus number of tracts selected for December Enumerative Survey. 2/ Includes Burley Tobacco Survey. 3/ Includes objective yield samples visited in November and November costs. 4/ Enumerative Survey only. 5/ Objective Yield only.

10.5 Research Fund Expenditures for Calendar Year 1957:

Research program work is planned and carried out mostly on a calendar year basis, thus coinciding with the normal seasonal progression of crop and livestock growth. However, funds are allocated and largely accounted for on a July-June fiscal year basis. Table 10.11, "Research Fund Expenditures - January 1-December 1, 1957," represents an attempt to provide cost data to accompany the data on work actually performed during the calendar year. It provides a close approximation of expenditures by class. Approximately $536,000 was obligated in 1957. Of this total, 38.5 percent was paid as salaries for full-time personnel in the Agricultural Estimates Division. Salaries of the Research and Development Staff and several other Washington people were paid from this fund. In each of the participating States, except the Western States, salaries of designated full-time personnel were paid from research funds. Salaries of the enumerators and supervisory enumerators are shown separately and total 23.5 percent of the total expenditures.

Travel is divided into two items: That involving Washington personnel, and that involving personnel in the various States. Field travel includes travel by State Supervisors, Supervisory Enumerators and enumerators, both during the surveys and at the time of hiring and training of temporary employees.

The heading "Other Contracts" consists of expenditures primarily for the items specified. A "College Contract" item is an amount which the Research Program contributed to the studies at North Carolina State College and Iowa State College over and above direct salary payments to people stationed at the colleges.

Table 10.11--Research Fund Expenditures - January 1-December 31, 1957

	Dollars	Percent
SALARIES:		
Washington Staff	59,900	11.2
Field Regular Staff	146,700	27.3
Field Non-regular Staff 1/	125,900	23.5
Total	332,500	62.0
TRAVEL:		
Washington Travel	7,000	1.3
Field Travel 1/	134,000	25.0
Total	141,000	26.3
COMMUNICATIONS:		
Washington Total	1,200	0.2
Field Total 1/	1,900	0.4
Total	3,100	0.6
PRINTING AND REPRODUCING	2,200	0.4
OTHER CONTRACTS:		
Graphics	100	0.02
Group Insurance (DC)	200	0.04
Group Insurance (Field)	500	0.09
Shop Requests 1/	4,900	0.9
Photos and Maps	3,800	0.7
College Contracts	23,000	4.3
Field Contracts 1/	1,700	0.3
Total	34,200	6.4
SUPPLIES, MATERIALS, EQUIPMENT:		
Washington Obligations	5,400	1.0
Field Obligations 1/	5,200	1.0
Total	10,600	2.0
FICA AND RETIREMENT		
Washington	2,100	0.4
Field Regular Staff	5,300	1.0
Field Non-regular Staff 1/	3,200	0.6
Total	10,600	2.0
TRANSPORTATION OF THINGS AND UTILITIES 1/	1,600	0.3
TOTAL 1957 OBLIGATIONS	535,800	100.0

1/ Items are actual calendar year expenditures. Because of a change in the
system of accounting made in July 1957, actual expenditures of items with
no footnote can no longer be computed on a calendar year basis. These items
have been entered at the average of the 1957 and 1958 Fiscal Year Obligations.